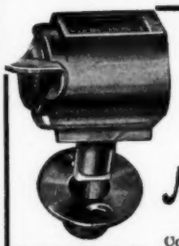
Telephony

THE AMERICAN TELEPHONE JOURNAL

PUBLISHED EVERY WEEK
BY TELEPHONY PUBLISHING CORP.
116 S. MICHIGAN AVE., CHICAGO, ILL.

OCTOBER 29, 1921. [VOL. 81. NO. 18.]
Entered as second-class matter Sept. 4, 1908, at the post office at Chicago, Ill., under act of March 3, 1879.

SINGLE COPIES, 10 CENTS
YEARLY, U. S. A., $3; CANADA, $4
ALL OTHER COUNTRIES, $5



Keeping count of calls handled daily means keeping informed on traffic tendencies—keeping ahead of service requirements.

Veeder

Counts the Calls

Sets into permanent socket in the keyboard; registers one for each pressure of the thumb lever.

Counters—attached to the keyboards—enable you to take periodic counts, give you data for forehanded management and show you the volume handled by each operator.

Send for booklet

Veeder Mfg. Co., 11 Sargeant St., Hartford, Conn.

Stops Losses and Complaints

In recording long distance toll messages the customer expects a bill for toll service based on the exact **elapsed time.**

That the Calculagraph does measure **elapsed time** with unfailing accuracy is borne out by the fact that this precision instrument has for the past 26 years been adopted in toll offices all over the world as standard equipment.

For an interesting story on this subject write Dept. 16.

THE CALCULAGRAPH COMPANY
30 Church Street — New York City

THE CALCULAGRAPH
THE ELAPSED TIME RECORDER

American Steel & Wire Co.'s

W & M Telephone Telegraph Wire

Strand—STEEL WIRE

Pole Steps

Descriptive literature—free

American Steel & Wire Company
Chicago
New York

EVERSTICK ANCHORS
lead the world
in anchor sales.
WHY?

EVERSTICK Anchor Co.
St. Louis, Mo. U. S. A.

CEDAR POLES

Wire or write for delivered prices

NATIONAL POLE CO.
ESCANABA :: :: MICH.
220 Broadway, New York
1844 Summit Street, Toledo, Ohio
Rialto Building, San Francisco

PEIRCE HAMMER DRILLS

enable you to drill holes in masonry rapidly, accurately and economically. Does the work in one quarter of the time required by any other method. Just the thing to use when installing expansion bolts—especially Peirce Expansion Bolts.

Ask Your Jobber

HUBBARD & CO., Pittsburgh, Pa.

The Hardware makes the Line—
Hubbard makes the Hardware.

Use the FRANKEL DUALCLIP with or without the pin

No. 2528
Patented June 27-'16

The DUALCLIP is extremely handy because of its adaptability to different uses.

The hardened steel pin is removable and when replaced holds rigidly. With the pin attached, the DUALCLIP is used for testing on insulated wires. Remove the pin and you have an ideal clip for use around binding posts, spark plugs, etc.

Order from your supply house
Booklet on request

MAKERS OF THE BEST ONLY
FRANKEL
CONNECTOR CO., INC. N.Y.

Manufacturers of

Vitrified, Glazed, Clay Conduit

We carry large stocks of round singles, square singles, two, three, four, six and nine duct, in standard and short lengths, splits, mitres and bends.

Service and Quality Guaranteed

THE CLAY PRODUCTS COMPANY
BRAZIL, INDIANA

Telephone Cables
ALL SIZES AND CAPACITIES

Hard Drawn Copper Telephone Wire
Galvanized Iron Telephone Wire
Siemens-Martin and High Strength Strands

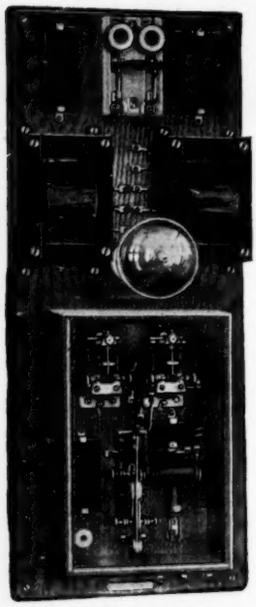
AMERICAN ELECTRICAL WORKS
PHILLIPSDALE, R. I.

CHICAGO—112 W. Adams St.
CINCINNATI—Traction Building
NEW YORK—233 Broadway
BOSTON—176 Federal St.

Matthews Scrulix Anchors

First Patented the market and Anchor on it is still first

W. N. Matthews & Bro., Inc.
St. Louis, Mo.



"7-A Frequency Converter"

Why Leich Ringing Converters are used in nearly every Telephone Exchange

LEICH ELECTRIC CO.,
Genoa, Ill.

Dear Sirs:

We do not want 30 days' trial on this converter as 3 days has convinced us that we want to keep it.

Yours truly,
(Name on Request)

If it costs you more than 50 cents per month to do your ringing write for complete information on LEICH RINGING CONVERTERS.

Free From All Patent Infringements

LEICH ELECTRIC CO.

Telephones, Switchboards, Accessories

GENOA, ILLINOIS

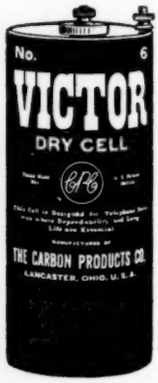
DISTRIBUTORS

ELECTRIC APPLIANCE COMPANY
Chicago, Dallas, San Francisco, New Orleans
ST. PAUL ELECTRIC CO.
St. Paul, Minn.

POST GLOVER ELECTRIC CO
Cincinnati, Ohio

TELEPHONE & ELECTRIC SUPPLY CO.
Spokane, Wash.
B-R ELECTRIC COMPANY
Kansas City, Mo.

Victor Telephone Batteries



VICTOR BATTERIES exactly meet telephone requirements. They are uniform in amperage and voltage, long-lived and give dependable service.

When using them make your own tests and keep your own records. Use the record forms we furnish with each shipment—your tests will prove the truth of our statement that Victor batteries will save money for every operating company that uses them.

Order a trial barrel today. Prices on request. Special lock nut binding posts without extra charge.

The CARBON PRODUCTS COMPANY
Manufacturers of
Dry Batteries and Carbon Products
LANCASTER, OHIO

MACHINE SWITCHING TELEPHONE SYSTEMS

for Public or Private Exchanges

THE AUTOMANUAL SYSTEM—An automatic system without dials, in which a few operators control the switching machines of a large exchange.

THE AUTOMANUAL SATELLITE—In which the machine switches in distant villages are controlled from AUTOMANUAL keyboards at a city exchange.

THE DIAL AUTOMATIC SYSTEM—In which the machine switches are controlled by dials at the subscribers' stations.

THE ALL-RELAY SYSTEM—In which there are relays only, with no moving selectors; adapted for dial or keyboard control.

THE NEW AUTOMATIC DIAL—Our latest product.

The North Electric Manufacturing Company
GALION, OHIO

Telephony.

THE AMERICAN TELEPHONE JOURNAL

Comprising Telephony, American Telephone Journal, Telephone Weekly, Telephone Magazine, Telephone Securities, The Telephone, Sound Waves

PUBLISHED WEEKLY BY TELEPHONY PUBLISHING CORP.
116 S. Michigan Ave., Chicago

H. D. FARGO, President and Treasurer.
G. M. ALLEN, Mgr., Copy Department.

S. R. EDWARDS, Editor and Secretary

J. R. HASTIE, Vice-President and Advertising Manager.
S. J. BORCHERS, Assistant Advertising Manager.

Entered as second-class matter September 4, 1908, at the post office at Chicago, Ill., under act of March 3, 1879.

Volume 81
Number 18

CHICAGO, SATURDAY, OCTOBER 29, 1921

Subscription—10 Cents a Copy
$3 a Year U. S., Cuba and Mexico
$4 Canada, $5 Other Countries

CURRENT OPINIONS AND COMMENTS

The threatened general railroad strike with all its alarming possible consequences has driven business leaders, civic organizations and, to some extent, everybody to plan how such an emergency could be successfully met.

Man is an inventive animal, and Americans are given credit for being more ingenious than other races in surmounting obstacles, so an attempt to tie up the railway facilities no doubt would find the country "carrying on" somehow. Plans to substitute motor trucks and automobiles for freight cars and passenger coaches have been made, and the use of boats and even airplanes has been given practical consideration.

In the event of a national emergency, like a big railroad strike, the telephone would be called upon to play a more important role than the duty it hourly discharges in ordinary times. Even if the government succeeded in keeping the mail trains in operation, the use of the more direct, more speedy, telephone toll message would be relied on to a much greater extent than usual.

* * * *

There would be great anxiety, in case of a strike, to safe-guard business, insure shipment of merchandise and care for rush orders which would add to the work of the telephone lines immeasurably. Telephone companies should not fail to prepare for such a crisis and be ready to justify the faith the public has in their ability to help in time of trouble.

Whenever catastrophe comes, the value of good telephone service is doubly appreciated, and its prompt, effective response in time of need has won this utility its leading place among the necessities of modern life.

There are many good make-shifts for railway transportation but no satisfactory substitute for telephone service.

* * * *

Telephone companies negotiating with their state commission on adjustments of service rates can obtain much helpful information from a study of the cost diagrams in George A. Scoville's article in the October 15 issue of Telephony and the statistical table compiled by E. C. Kast, secretary of the Minnesota Telephone Association, which appeared in last week's issue.

A great deal of emphasis can be effectively laid on the fact (shown by Mr. Scoville in Fig. 2) that wages paid by the operating company have as yet made no downward dip, and that operating costs, in that particular at least, are still at what is termed the "peak".

Beginning in 1915 the wages of foremen, linemen, installers, cable splicers and cable helpers were steadily increased until 1920, and since then have maintained the same level. The "average of hourly wages" in that five-year period rose to 166, or 66 per cent over the pre-war basis, and is still at that figure.

* * * *

With the exception of copper, the present price of all material is far above 1914 levels, although there have been declines during the last year. The average price of all commodities, notwithstanding the big declines of 1920 and 1921, is still far higher than the 1914 figures.

The operating companies, therefore, have good grounds for maintaining existing rates, and, in fact, the logic of the situation would justify commissions in raising rates in many cases. Material that went into replacements and extensions the last four or five years may be bought more cheaply today, but if rates are based on valuation, no company should be penalized because war conditions forced it to pay peak prices in order to serve the public which was clamoring for telephones.

It is well known, too, that no company bought a nickel's worth of equipment during the era of high prices that it could possibly get along without. At least that is true of Independent telephone men who have been educated to practice strict economy.

* * * *

There has been no profiteering in any branch of the telephone industry at any time—not even during 1917-1919, when it seemed to be the fashion in other lines to charge all the traffic would bear because "everybody was doing it."

The figures show that the telephone manufacturers have not raised prices to the extent that nearly every other line did, and, in fact, that their increases followed closely the advances that came in wages, which were inevitable.

Neither have the operating companies seized the chance to demand rates commensurate with the advances in other branches of utility service. Street car-fares have gone from 5 to 10 cents in some cities—even in Seattle where the city owns and operates the car system—the fare is 10 cents—but we do not recall that telephone service anywhere has doubled in cost. The man who said that telephone service was the cheapest thing next to one-cent mail postage hit the nail on the head.

* * * *

The importance of fixing rates with particular regard to the high cost of materials in the past six years is shown in a recent case of a large company in the Middle West. According to the commission's engineers, the actual value of the physical property is to be set down at a trifle over five millions.

The company's engineers filed two valuations, one based on figuring reproduction value to the plant at the average costs prevailing from 1914 to 1919, which yielded a total of over seven millions, and another fixing reproduction value on the basis of 1920 costs, which ran the total to over ten millions.

There is a tremendous difference here which emphasizes how important it is in figuring rates to take into consideration the cost of materials when the additions were made to plant.

* * * *

Fairness demands that abnormal conditions should be reckoned with in arriving at values in rate adjustments. During the years 1914-1919, the public demand for telephone service grew to unprecedented proportions.

Supposing the companies had answered: "Prices are too high now. We can probably serve you more cheaply in three or four years, so we will defer making extensions and you can wait until a more opportune time for telephone service."

The public and the commissions would have indignantly ordered the companies to quit business and let somebody else tackle the job of supplying telephone service—and quite rightly, too. The companies, however, grappled with the problem and did their best to fill the demand, even at greatly increased costs.

These facts should be borne in mind by the rate-fixing authorities and by the public, and the companies permitted to earn a fair return on the capital they invested in times of general inflation. The inflation, however, did not extend to rates for telephone service.

* * * *

Have you a pessimist, a crape-hanger, in the bunch with which you associate? If so, read this suggestion how to handle him, which appeared in a recent bulletin issued by the Illinois Independent Telephone Association:

"When general business conditions are rapidly improving after the recent slump, it is time to labor with the few members of the society of pessimists whenever they are encountered. Pessimism is a frame of mind and has nothing to do with facts, so if you cannot convince the pessimist that he is wrong, do not listen to him but get out of range of his destructive line of talk."

Pretty good advice that. The man who cannot keep an audience, soon wakes up to the fact that he is on the wrong track. Optimism is better than pessimism.

Automatic Switching of Toll Traffic

Historical Outline of Development of Use of Automatic Switches in Making Toll Telephone Connections—Present Status of Development and Various Circuits Used—Paper Presented Before Western Society of Engineers

By Arthur Bessey Smith
Chief Research Engineer, Automatic Electric Co.

The object of this paper is to place before you some of the means which are used in setting up toll telephone connections by automatic switches, together with enough of the historical development to show the present status of this branch of telephony. It is believed that many of the devices used are of interest to telephone and telegraph men, and to many of the power electrical people.

Toll Service.

Service to the public is the first consideration of telephony. Aside from this there is no right to expect a revenue. It is in accordance with the paradox of business, that he who would honestly make money must apparently forget money, devoting himself to serving others in those things for which they are willing to pay.

It is a matter of record that he who whole-heartedly serves others, having due regard to financial safety, always profits by it. To give the best possible service to the public is the aim of the telephone industry.

In general, the desirable elements of toll service are the same as of local service. Among them are accuracy of connections, speed of securing connections, and easy conversation.

The toll operating company rightfully tries to get the greatest possible revenue with the least possible investment, keeping in mind the quality and reliability of service. Of great importance in this respect is the time-efficiency of telephone toll lines. Low time-efficiency means great investment to handle a given amount of traffic.

Telephone toll business cannot be stored to the extent that telegraph business can be stored. A conversation calls for the simultaneous presence of two persons in two different places but on the same line. The only call-storage possible is to ask people to wait for a time, until the line is ready for use, which gives little increase of service.

From the standpoint of operating, there is much time lost in setting up and breaking connections by hand. Manual operation induces methods which are peculiar to it, though they are sometimes not recognized as such. The slowness of getting operators at intermediate toll-switch offices to set up and dis-connect a circuit has led to the use of many direct lines between cities quite far apart. This necessitates more investment in lines and their equipment, but is often felt to be worth the cost because of the immediate availability which they secure. This is a condition which is peculiar to manual working.

There are a few parts of toll service which are essentially manual, such as: Information — rates, conditions, etc.; charging for service—records, timing of calls, discrimination, etc.; supervision—introduction, release, etc.

There are some cases of long free trunk lines which are in many respects like toll lines, though they do not have the above-named manual essentials. But the technical handling of switching is the same.

Any improvement is welcome, if it

gives better service without more cost. It is doubly welcome if it improves service and at the same time reduces the cost. That is what automatic switching on toll lines has been found to do.

Why Automatic Toll Switching?

Automatic toll switching is used because it enables more business to be done over the same lines, and shortens the time which the user has to wait for his connection. This is secured by the high speed with which a connection is set up and disconnected. The latter is a gain of especial value, particularly at intermediate switching offices.

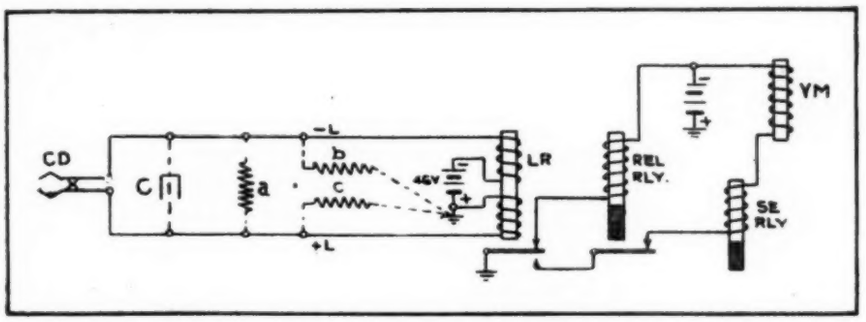


Fig. 1. Diagram of Two-Wire Circuit Used in Automatic Telephone Exchanges.

Manual toll switching is usually conducted as follows:

The subscriber calls the *A* operator and requests long distance. The *A* operator plugs up the connection to a recording toll operator who records the desired call on a ticket and informs the subscriber that he will be called when the connection is ready. This connection is then pulled down.

The recording operator passes the toll ticket to a toll line operator who calls an intermediate toll office—if there be one—and requests a line to the desired city. The toll operator at the intermediate office connects the line through and rings the desired city, or permits the toll operator at the originating exchange to do the ringing.

The toll operator in the distant city answers the call and plugs up a connection to the *B* board in the desired office in that city. The *B* operator then plugs up the connection to the desired subscriber line.

As the connection approaches completion, the toll operator in the originating exchange calls a *B* operator in the proper office, who plugs up a connection to the calling subscriber's line. When the called person in the distant city answers, the toll operator in the originating exchange calls the subscriber who originated the call and permits conversation to take place, making record of the time consumed.

When the subscribers hang up their receivers, the toll line operator in the originating exchange, and the corresponding operator in the called exchange, are expected to get in on the line as soon as practicable and assist each other in pulling down the connection. It is often necessary to ring the operator at the intermediate toll office to get her to pull down her cord.

Automatic switching of toll lines is usually conducted as follows:

The subscriber dials the long distance number, which almost instantly connects him to the recording toll operator who records the call as just described and informs the subscriber that he will be called. The ticket is passed to the toll line operator, who dials up a connection through the intermediate toll office, on to the distant city, and directly to the line of the called subscriber. In all of this she is not delayed by waiting for the help of any other operator.

When the called subscriber answers, the toll operator dials the number of the calling subscriber which automatically connects the toll line to the calling telephone. Conversation now proceeds.

If desired, the toll operator can call the calling subscriber's line and hold it until the called person answers.

When both subscribers hang up their receivers, the toll operator pulls down her cords. This automatically causes all the switches in the three places to release and be restored to normal. This action is accomplished in less than one second.

Although development work has been going on for many years, the period of greatest activity in experiment and development was from 1910 to 1916.

Historical Notes.

Tabular presentation shows the development most easily:

1907. Los Angeles, Cal., John Wicks dialed from Los Angeles to San Diego, 125 miles (201 km), three-wire operation. Trial successful, although the line was in bad shape.

1910. Newark to Columbus, Ohio. Trial circuit, three-wire operation, successful. Resulted in 30 circuits being put into use automatically in the next few years.

1910-1911. San Francisco and Oakland, Cal. Suburban toll, two-wire.

1911. Aurora to Chicago, Ill. B. C. Groh used simplex circuit through center of repeating coil.

1912. South Bend from Fort Wayne, Ind. Simplex dialing, with way station at Warsaw, Ind.

1913. Winnipeg to Brandon, Canada. Simplex dialing.

H. M. Friendley's A. I. E. E. paper on automatic toll switching, Vol. 32, Part 2, page 1305 (TELEPHONY of June 28 and July 5, 1913).

1914. Quadruplex dialing and quadruplex with phonoplex, produced by Arthur Bessey Smith.

1915. Quadruplex common side used to dial from Houston to Dallas, Texas (polar side used for Morse).

Private automatic exchanges connected by long trunks, Great Northern RR. St. Paul to Duluth.

Composite used for automatic dialing on physical lines and on phantomed lines, Ohio State Telephone Co., John Wicks.

1917. Dakota Central Telephone Co. connected six exchanges by automatic toll lines.

1920. Canada. Edmonton to Calgary, simplex dialing on phantom circuit 300 miles (483 km).

Canada, Saskatoon, Regina and Moose Jaw, automatic toll lines simplexed without manual ringing.

Automatic dialing over toll lines is most profitable in a region filled with automatic exchanges, for then the operator at the originating exchange can dial to the called subscriber without the aid of any other operator.

Operating Conditions.

It is believed that as the present wave of automatic exchange construction makes itself felt in the years that are coming, there will be increased use of automatic toll switching, first for the short-haul business—perhaps under 500 miles (804 km)—and afterwards for much longer lines.

Practice is tending toward the following conditions as desirable to be met by any device for dialing over toll lines:

1. Dialing must not cause noise on adjacent circuits, or at least not enough noise to affect commercial transmission of the voice.

2. When an operator seizes the line, the line must be made busy wherever it may be seized by any other operator or any switch.

	No. 8 B & S per mile	No. 8 B & S per km.	No. 10 B & S per mile	No. 10 B & S per km.
Conductor resistance, loop, ohms	6.8	4.2	10.8	6.7
Single-wire ohms	3.4	2.1	5.4	3.4
Insulation resistance, single-wire, megohms:				
Erratic (dry weather)	10	16	10	16
(Wet weather)	1	1.6	1	1.6
Capacitance, 2-wire loop, M.F.	0.0086	0.0053	0.0082	0.0051
Simplex to earth, M.F.	0.0123	0.0076	0.0121	0.0075
Inductance, 2-wire loop, m.h.	3.53	2.19	3.68	2.29
Simplex to earth, m.h.	2.14	1.33	1.81	1.12

Table Showing Approximate Values of Four Electrical Properties.

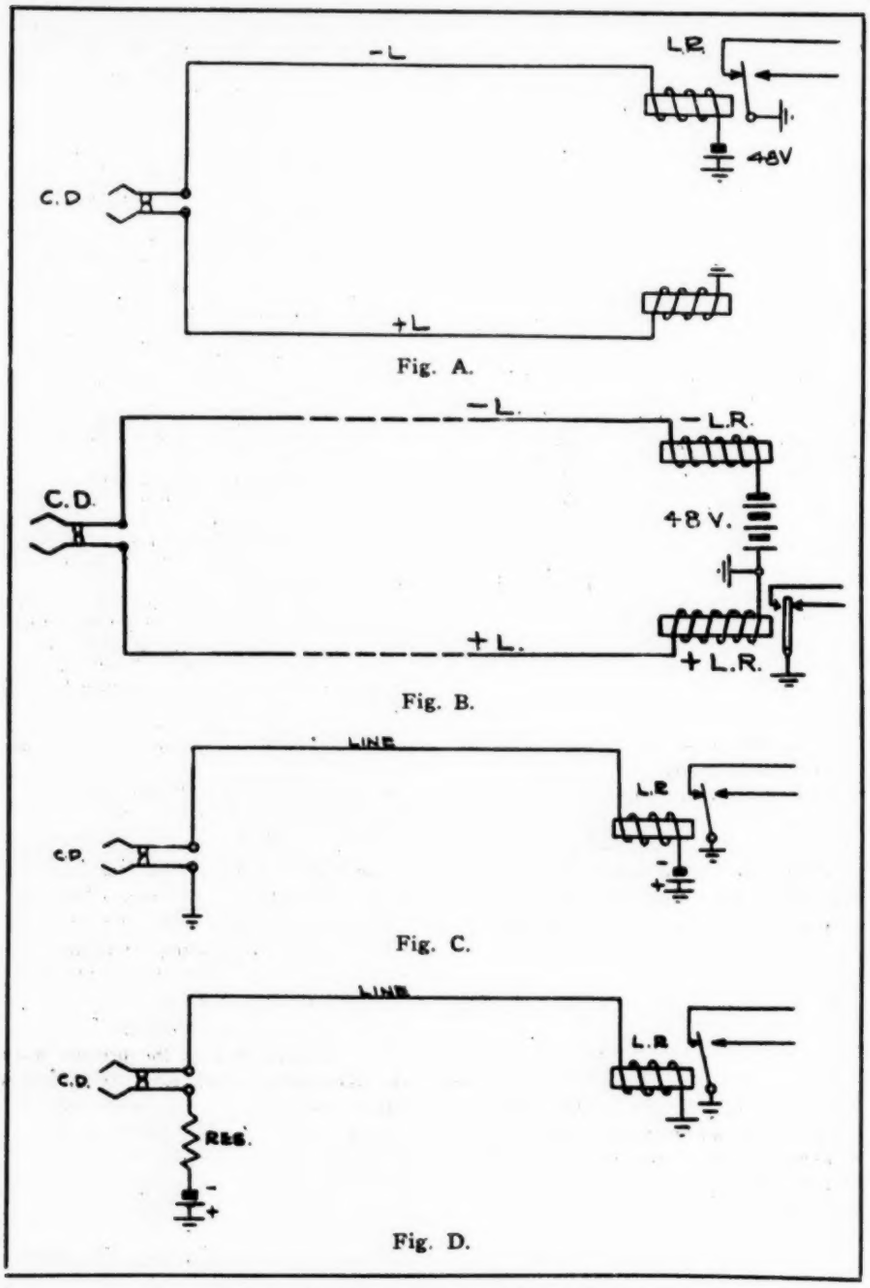


Fig. 2. Various Types of Dialing Circuits.

3. The release must be simple, such as the pulling out of the plug of the toll cord.

4. If the called line is busy (in the distant city) or if desired section of the toll line is busy, an audible signal must be returned to the calling operator.

5. Ringing must be accomplished by the same act as for manual operation—that is, by the operator pulling the ringing key on the cord.

6. The line must be capable of being used manually at any time.

Though these conditions are recognized as being desirable, many toll lines are being operated automatically with great satisfaction with one or more of the conditions unmet.

For instance, some have cut loose entirely from manual operation, causing the operators to dial on the toll line for everything that they want. The ringing is automatic in the same way that it is arranged for local calling, and the operator does not ring on the line at all. Many variations are found in practical use, from all of which most experience is being obtained.

Toll Line Properties.

To dial over a toll line for setting up automatic switches is essentially a telegraph matter, with the conditions of telephony added. But there is this difference—the apparatus must not need as much wet-weather adjustment as is permissible in telegraph work. The relays are expected to work through all variation of weather from dry to wet and back again.

Copper wires Nos. 8 and 10, B & S gage, are the most typical of the toll lines in which automatic dialing has been done.

If we consider only open-wire lines, the four electrical properties will have approximately the values shown in the table presented on the preceding page.

Dialing Circuits.

It is well to consider the line circuits by means of which the switches at a distant exchange are controlled. We will examine them as they appear without any means for involving them in the talking circuits—merely as impulse-transmitting circuits.

The two-wire circuit of Fig. 1 is that which is now used by all automatic telephone exchanges. The two battery conductors pass through the two windings of a line relay, *LR* to the two lines wires, $-L$ and $+L$, and unite at the contact springs of the calling device, *CD*, in the subscriber's telephone.

Leakage from one line wire to the other affects the dialing adversely about twice as much as leakage from the negative line (−L) to earth. Leakage from the positive line (+L) to earth does not affect the dialing very much. In fact, on a line of moderate length it may be dead grounded without causing the switch to fail. This circuit is not much used for dialing on toll lines.

The two-wire, two-relay circuit of Fig. 2-*A* is not very much used. Since the line relay is in the negative lead alone, it gets the full benefit (!) of any leakage on the line.

The two-wire, two-relay circuit of Fig. 2-*B*, with the impulsing relay in the positive lead is much used for rural exchange

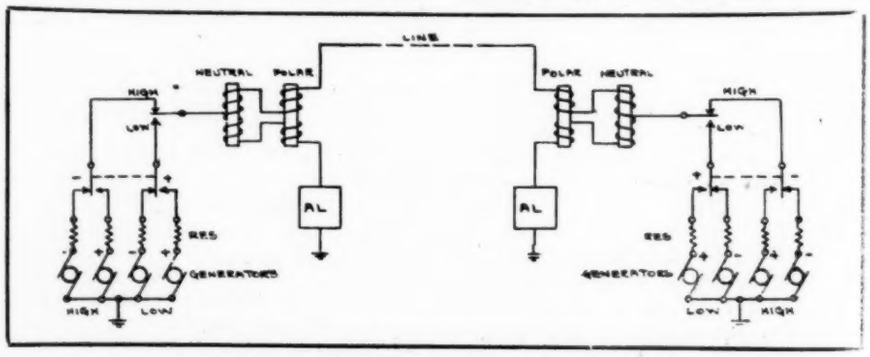


Fig. 3. Differential Type of Quadruplex Circuit.

lines, where there is likely to be much leakage. For this purpose it is much better than Fig. 1. It is usual to reduce the impedance of the relay in the negative lead during dialing by shunting it with a non-conductive resistance.

The single-wire circuit of Fig 2-*C*, with line relay and battery at one end of the line, is often used for local dialing over a wire which is separate from the talking wires. It dials about the same as Fig. 2-*A*.

The single-wire circuit of Fig 2-*D*, with battery at the calling device end of the line, is the best for toll dialing and is most used for that service.

The differential type of quadruplex, Fig. 3, is familiar to all telegraph men. The polar side works better than the common side, although the latter is very good, largely because the battery is at

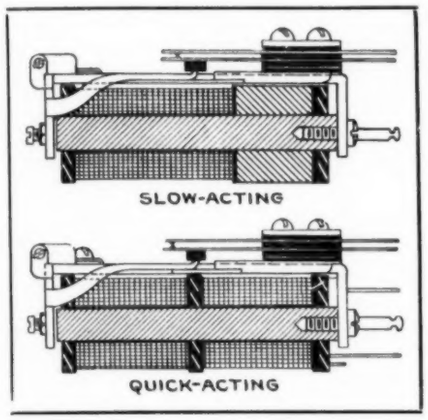


Fig. 5. Horizontal Automatic Relays.

the calling device end of the line. It is especially valuable for two-way dialing.

Characteristics of Dialing Circuits.

It is valuable first to consider some of the properties of the most used dialing circuits and then to show how these fundamental circuits are attached to actual toll lines. Line resistance and leakage alone are considered, because a consideration of capacitance and inductance and combinations of them in various ways would carry us beyond the limits of this paper.

The line relay of the usual automatic exchange has a work whose nature may be explained by reference to Fig. 4.

The line circuit, normally open, closes through the telephone when the receiver is taken off the hook. This energizes the line relay, *LR*, which in turn operates the release relay. The latter prepares the magnet circuit from the back contact of the *LR* line relay through the series relay and vertical magnet to the negative battery terminal.

When the user operates the calling device for the first digit, the impulse springs, *CD*, open and close the circuit once for each unit in the digit. During this time the shunt spring short-circuits the talking apparatus.

The interruptions produced by the calling device cause the line relay to vibrate

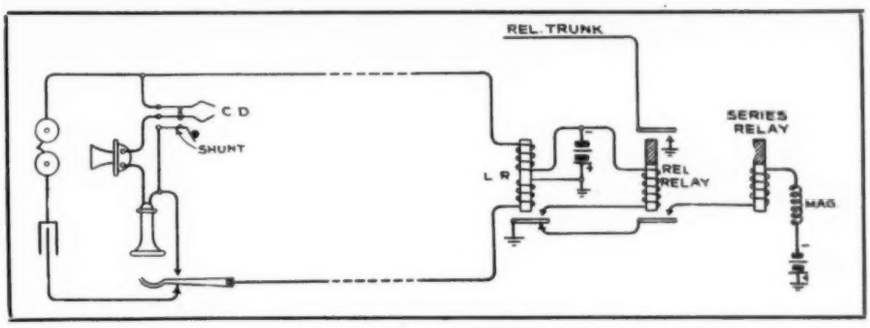


Fig. 4. Circuit Illustrating Work of the Line Relay.

its armature. Every time it falls back it sends a pulsation of current through the series relay and vertical magnet. Every time it pulls up it sends current through the release relay.

On each back stroke it must cause enough current to flow to operate the vertical magnet, and energize the series relay enough to enable it to hold energized

Line impulses which are too long, Fig. 6, will permit the release relay to fall back and release the apparatus. Line impulses which are too short, will usually cause the series relay to fail to hold, resulting in premature switching to the next function.

The first group of impulses acts on the vertical magnet, lifting the wiper shaft.

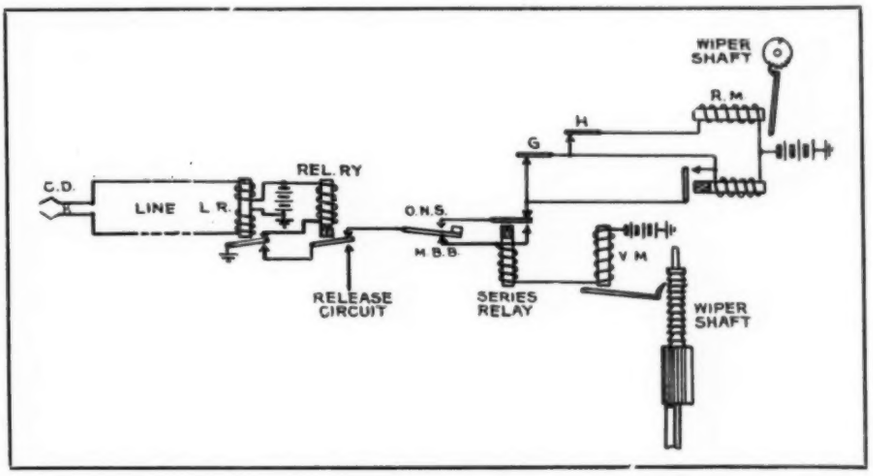


Fig. 6. Controlling Circuit for Automatic Switchboard.

until the next back stroke. On each forward stroke, it must energize the release relay strongly enough to enable it to remain energized until the next forward stroke. Thus the line relay must divide its attentions between the two circuits.

The series relay and the release relay are of the slow-release type, equipped with copper collars, Fig. 5. The Foucault current developed in the copper retains the magnetism during a brief interruption of the exciting current.

The second group of impulses must act on the rotary magnet, to rotate the shaft. It is the duty of the off-normal springs and the series relay to control the switching of the circuit from one function to the other.

The relation of the line impulses to the magnet impulse may be seen schematically in Fig. 7. The total period, *T*, of the impulse is from *A* to *C*, or from break to break of line current. The duration of break is from *A* to *B*. The impulse ratio

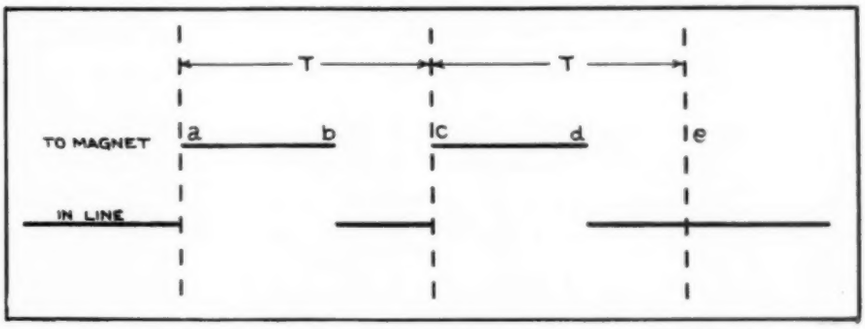


Fig. 7. The Relation of Line Impulses to Magnet Impulses.

is the ratio of the duration of break to the total period of the impulse.

The magnet impulse would be an exact complement of the line impulse were it not for the time lag of the relay and the imperfections of the line circuit.

It has been possible to build a line relay which operates a switch under widely varying line conditions. This will be shown later in the discussion of circuits.

(*To be continued.*)

"Let's Go!" That's Cry About National Convention.

Reduced railroad rates have been obtained for those attending the convention of the United States Independent Telephone Association in Chicago at Hotel Sherman, November 15 to 18, providing there is an attendance of 350 members of the organization.

In connection with the meeting, there will be a luncheon of the officials of the various state associations. These luncheons have been a feature of the national conventions for the past few years and the one this year will undoubtedly prove more interesting than ever before. It will probably be held on Wednesday, November 16.

On Thursday, November 17, the Independent Pioneer Telephone Association of the United States will hold a luncheon. The committee in charge, which consists of Frank L. Eldridge, W. S. Vivian, George W. Rodormer, and H. D. Currier has a "surprise" program in preparation. All of the committee members are well-known and that a live program will be put over, goes without saying.

As previously stated, a rate of one and one-half fare on the certificate plan will apply to all members and dependent members of their families attending the national convention. These rates will apply from the territories of the Western Passenger Association, the Trunk Line Association, the Central Passenger Association, the Southeastern Passenger Association, and the Transcontinental Passenger Association (except California, Nevada, and Portland, Ore.).

Tickets at the regular one-way adult tariff rates for the journey to Chicago may be obtained from November 11 to 17 only, and when purchasing tickets, members are especially requested to ask for a certificate. Under no circumstances is a request to be made for a "receipt."

Certificates will not be obtainable at all stations, but in such cases, a local ticket to the station which does have certificates in stock (this information to be obtained from the agent) may be purchased and then a through ticket and certificate to Chicago obtained from the latter station.

Immediately upon arrival in Chicago, those planning to attend the convention are urged to register at the convention headquarters at Hotel Sherman and leave their certificate with the registration clerk so that it may be endorsed by Secretary C. C. Deering. Reduced fares for the return trip will not apply, unless properly endorsed by Secretary Deering.

It has been arranged for a special agent of the carriers to be in attendance at the Hotel Sherman on November 17 and 18 from 8:30 a. m. to 5:30 p. m. to validate certificates. Representatives attending the convention who leave for home prior to the special agent's arrival cannot have their certificates validated and, consequently, will not be entitled to the benefit of the reduced fares. No refund of fare will be made on account of failure to either obtain a proper certificate or failure to have the certificate validated.

As previously stated, the fare reduction is contingent upon the attendance of not less than 350 members of the organization, as well as dependent members of their families, holding regularly-issued certificates obtained from ticket agents at the starting points, showing payment of regular one-way tariff rates of not less than 67 cents on the going journey. The half-rate tickets will be negotiable up to and including November 22. Return tickets issued at the reduced fare will not be good on any limited train on which such reduced fare transportation is not honored.

It is suggested to those coming from the Pacific coast points that they avail themselves of the tourist fares, while those coming from the territory where no reduced rates are offered, are urged to purchase tickets to the nearest station where such rates apply and there purchase a ticket to Chicago, at the same time asking for a certificate.

Three Iowa District Meetings Scheduled for Next Week.

A series of three district meetings are scheduled to be held by the Iowa Independent Telephone Association next week, according to word received from Secretary C. C. Deering. On November 1 the first meeting will be held at West Liberty, November 2 one at Fairfield, and November 3 another at Creston.

Questions that are uppermost in the minds of Iowa telephone men, such as inductive interference, collections and rates, together with any further ones that may come up at the meetings, will be fully discussed.

Telephone men in these three towns and surrounding territory are cordially invited to attend the three meetings.

THE WORM IN THE APPLE

By Miss Anne Barnes.

Traveling Chief Operator, Iowa Independent Telephone Association, Des Moines, Iowa.

There are people who absorb everything desirable that comes their way, and, like an oversoaked sponge, retain what they can—what they cannot, goes to waste. Such people are careless and wasteful with privileges. When we come in contact with people who are affected with this unhappy quality, if our contact is of any duration, we may be considered unfortunate.

Hotel people dread them, for they are destructive and wasteful. They sometimes carry away in their grips what they cannot use. They turn on all of the lights, go out and leave them on, as they also do the water. They scorch blankets and tables pressing their clothing—and then they wonder why the rates are so high on hotel rooms.

Quite recently I visited an office which was ideal in every respect. The work was made simple because of the up-to-date equipment. The restroom was comfort itself. From the operators' kitchen the odor of good coffee sent out its invitation to come and drink.

One day in the kitchen, I saw a cup of coffee seasoned to taste with rich cream and sugar, standing on the table *cold* where some operator had left it. She evidently decided that she did not care for coffee after she prepared it.

A contrasting picture came to my mind of an office I once visited where the operators hung their lunches on strings to keep the mice from eating them. I could not help but wonder what these girls would have said if given a cup of coffee like that, even in the crowded corner behind the switchboard where they lunched.

Many of our real blessings in life are so close to us that we fail to see them in their right proportions and, therefore, lose the value of possession.

MORAL: A worm does not *need* a whole apple to live in—but it takes possession.

Principles of Telephone Traffic

One of a Series of Articles Setting Forth the Fundamental Elementary Principles of Telephone Traffic Work—Every Operator and Manager Should Read These Articles—This Article Discusses the Private Branch Exchange

By E. L. Gaines

Traffic Superintendent, Home Telephone & Telegraph Co., Ft. Wayne, Ind.

Only a few years ago the private branch exchange operator was merely a girl who answered telephones; today, her position is one of the indispensables of modern business.

She guards the door through which a large portion of her firm's business enters daily. She is the first to greet the customer and the prospective customer. She is first to greet the dissatisfied patron and see that his complaint is properly looked after. It is the "P. B. X." operator who gives needed information to prospective buyers of her firm's wares and who closes the doors to the competitor or other person who desires information that should not be given out.

The position held by the telephone operator of the private branch exchange is unique in that it is without a parallel in the entire telephone business. While not ordinarily an employe of the telephone company, she is as vitally interested in telephone service as one of the telephone company's operators, and is more vital to the service of her employer than the regular exchange operator on account of the fund of ready information regarding his business she has at hand and the degree of intelligence she uses in rendering him service.

Many prominent telephone engineers have predicted that the days of the telephone operator are numbered; that machines will ultimately replace all operators. Machines can be made to do almost anything a human being can do, but they cannot be made to *think*—and a P. B. X. operator must think, and think quickly, and follow her thoughts with prompt actions intelligently executed. The P. B. X. operator will never be replaced by a machine or any automatic devices; such things are only an aid to her in carrying on her work.

The necessary qualifications for the position of P. B. X. operator are many and varied. She should be a good telephone operator familiar with both local and long distance work. She should have a thorough knowledge of the operation of her particular P. B. X. system and must be able to tell when any of the equipment is not working properly. She should know her firm's business from *A* to *Z*, and her knowledge must be kept strictly up-to-date. She should know the functioning of the various departments of the organization—should know the department heads by name and telephone number.

The residence and club addresses of all members of the firm must be at her finger tips, and she should study the personal habits of each member until she knows that Mr. Jones may be found at his residence on Saturday mornings or that Mr. Smith will always be at the club for luncheon. She must understand the business methods of her company and be able to sense the importance of certain calls over others.

THE JOB AND THE MAN.

There is no job in the world but what can be done a little better; so the same job in the hands of two different types of employes becomes two entirely different jobs. The job and the man find a common level. A big man on a small job soon elevates that job into the big-job class. Conversely, a small man on a big job soon causes the job to deteriorate into the small-job class.—George H. Rush, general manager, Morris & Co.'s By-Products Interests.

The P. B. X. operator may be termed the private secretary of the firm. The position is so vital to the welfare of the firm that, in many large business organizations, the P. B. X. operator attends all meetings of department heads in order that she may be fully conversant with the affairs of the company at all times.

The same high type of girl that makes an efficient secretary is required to fill the place of P. B. X. operator satisfactorily.

The actual operating of the P. B. X. switchboard varies with the type of equipment and the method of supervision employed. There is some dispute among telephone engineers regarding the supervision of P. B. X. calls.

A common method employed is one in which the regular subscriber's operator at the telephone exchange receives no disconnect supervision after a conversation is finished until the P. B. X. operator takes down the connection on her board.

A less common method is one in which the subscriber's operator at the exchange receives the disconnect signal immediately when the P. B. X. subscriber finishes his conversation and hangs up his receiver, even though the connection is still up on the P. B. X. board. In this case the P. B. X. operator receives no disconnect signal until the connection is released by the local operator.

With the first-mentioned method, the P. B. X. operator has more complete control of the connection than in the second. It is, therefore, necessary for her to be more prompt in taking down connections and to pay closer attention to the supervision of calls than if the second-mentioned type of supervision were used. This is especially true of long distance calls.

In a third arrangement of supervising facilities, the supervisory lights on the private branch exchange board and on the city board are both operated simultaneously by the P. B. X. subscriber hanging up his receiver. This third method will usually secure the shortest trunk-holding time and is particularly advantageous on that account.

But very little has ever been said or written as to just what the exact functions of the P. B. X. operator should be. The private branch exchange is nothing more or less than a complete telephone system and one in which those who are in authority usually know but little about the telephone business or telephone operating methods. The business head of the firm having a P. B. X. system usually makes his own rules and regulations governing the work of the operator and the handling of the firm's calls.

These rules are usually made to suit his own convenience and are often made without a study of the firm's actual needs or the convenience of its patrons. Thus, if Mr. Brown, the secretary of the firm wants to talk to Mr. Smith of another firm in the same city, he merely tells his P. B. X. operator to get Mr. Smith on the line. The P. B. X. operator looks up Mr. Smith's number if she does not already know it and after getting Mr. Smith, calls Mr. Brown and establishes the connection.

From Mr. Brown's standpoint, this arrangement is undoubtedly ideal—but not so for Mr. Smith. He has answered his telephone, thinking that some one is on the line wanting to talk to him, only to find that he must wait someone else's will and pleasure. Mr. Brown has saved his own time and wasted Mr. Smith's.

If Mr. Smith is Mr. Brown's employe, the case is excusable but if Mr. Smith is a prospective customer, as is usually the case, the discourtesy shown is not conducive to increased sales or good will.

If Mr. Brown is considerate of the feelings of the person he desires to speak

Strowger—The Pr

The final question in

In buying any apparat
that it will earn a fair pr
and subscriber will all lose.

Twenty years ago, w
they are today, Strowger A
basis of making better pr
in hundreds of cities, large
would earn better profits.

The twenty years' r
ment means that even whe
if they ever do, companie
tinue to make better profit

And remember, eve
manufacture, every simpli
material costs and every
the companies which b
prices. Already almost o
by war conditions have be

Telephone executives
buying means a careful st
equipment. Let us help
today.

Strowger is the telep
and will be the telephon
service are sought.

AUTOMATIC EL

FACTORY AND GENE

BRA

New York City 21 East 40th St.
Philadelphia The Bourse Bldg.
Boston 445 Tremont Bldg.
Detroit 525 Ford Bldg.
Cleveland 415 Cuyahoga Bldg.

ASSOCIA

INTERNATIONAL TELEPHONE SAL

International Automatic Telephone Company, Ltd., London.
Automatic Telephone Mfg. Co., Ltd., Liverpool

itable

ess is "will it be profitable?"

ephone company must *know*
rwise stockholder, manager

rating costs were half what
c equipment was sold on the
ce then it has been installed
all, with the thought that it
case it has made good.

Strowger Automatic equip-
ng costs return to "normal,"
tall this apparatus will con-

ntage of efficient quantity
of design, every lowering of
n of wages, is passed on to
wger equipment in lowered
of the increases necessitated
out.

ealize that prudent, careful
e profit features of Strowger
your study of this problem

today in hundreds of cities,
orrow wherever profit and

CTRIC COMPANY

FFICES, CHICAGO, ILL.

FICES:

Columbus	Rochester	Pittsburgh	Washington	Kansas City
Ferris Bldg.	612 Mercantile Bldg.	608 Fulton Bldg.	405 Munsey Bldg.	1001 New York Life Bldg.

MPANIES:

NGINEERING CORPORATION, New York
ncaise pour l'Exploitation des Procédés Thomson-Houston, Paris
Automatic Telephones, Australasia, Ltd., Sydney

with and has a proper regard for the ethics of telephone service, he will ask for a line and place his own call and stay on the line until his party answers. The P. B. X. operator, however, is working for Mr. Brown and must handle the calls as instructed by him. Telephone companies will do well to conduct educational campaigns among their P. B. X. subscribers in order to teach the most effective methods of utilizing P. B. X. equipment and service.

Occasionally a private branch exchange operator will be given instructions to call no one on her local lines until the other party to the conversation is at the telephone ready to talk. It is evident that it is impossible for the members of two firms, whose operators have such instructions, to talk with each other, since neither operator dares put up her party first. It is also evident from this that due consideration of the other party's convenience must always be given in formulating rules governing a private branch exchange operator's work.

Exact standards and set phrases for operating cannot be prescribed for the P. B. X. operator, except in certain instances. The lines on the P. B. X. board are divided into outside lines, or trunks to the regular telephone office, and inside lines to the various offices and departments of the firm. Calls from outside the firm over the trunks should always be answered by giving the firm name in full, as "B. B. Brown and Company," or "Douglass & Sons," or whatever the firm name may be. The P. B. X. operator should never abbreviate a name or shorten or change it in any way but should always give it in full.

If the calling party does not respond to her answer with the firm name, she should say, "This is B. B. Brown and Company," or whatever the firm name may be, and if necessary after a slight pause, add "What is it, please?"

When the calling party responds by giving the name of the individual or department he wants to talk to, the operator should repeat the name or department and add "I will ring them for you," and proceed to complete the call. If the calling party does not know just what department or person he should talk to, the P. B. X. operator should tactfully ascertain the nature of his message and refer the call to the proper place.

She should never leave the calling party in doubt as to what she is doing with his call but after finding where the call should go, should say "I will ring Mr. Brown for you," or "I will ring the advertising department," or whatever the case may be.

She should remember that although she is thoroughly familiar with the various departments of her firm and its business methods, the average customer who calls for information is not familiar with them and, unless given the needed assistance, may give up the call before getting through to the proper department or person and very likely a sale will be lost as the result. If a delay occurs in completing a call on account of difficulty in obtaining an answer from a telephone or in locating the desired person, the calling party should be kept informed at all times of the effort being made to complete his call.

When answering inside lines, the P. B. X. operator should say "What is it, please?" and should always repeat her subscriber's request in order that he may know she has understood it properly. The various inside lines should be plainly marked on the designating strips on the face of the switchboard with both names and numbers.

It is customary in most private branch exchanges for the different departments or individuals to call by name within the exchange. This system will not be found practicable in extremely large installations where there are several hundred inside lines. In such cases, a P. B. X. directory should be issued by the firm and used on all inside calls. When a P. B. X. directory is used, it is customary to prefix all numbers with the word "Terminal" in order that the numbers may not be confused with outside or city numbers.

In many small private branch exchanges the operator is not kept sufficiently busy taking care of telephone calls to utilize all of her time. In such cases it is usual for her to do other work such as checking, billing, typing, etc., and frequently acts as information clerk to the general public. The switchboard is usually located in a conspicuous place in the office lobby where it is conveniently accessible by the public. The operator should not be burdened with too much detail work other than operating or the service will be seriously affected.

When the telephone business of a concern grows large enough to occupy all of an operator's time, the switchboard should be removed from its public position in the office lobby to a private office where the operator may give her undivided attention to her work.

In order that various departments of an institution served by a private branch exchange may have service at night when no regular P. B. X. operator is on duty, the trunks are plugged up at night on the private branch exchange switchboard to the various offices or departments that are likely to need night service. Thus one telephone on each floor may be connected with an outside line at night for use by the night watchman in cases of emergency, or any one department or office where employes are required to work after regular office hours may be connected in this manner for night service.

The subject of relations between the telephone company and the private branch exchange subscriber, and the company's operators and the private branch exchange operators, is one that deserves a great deal of attention. Until recently telephone companies did not co-operate with their private branch exchange subscribers in securing competent help to operate their switchboards. Frequently operators discharged by the telephone company, or disgruntled operators who had quit the company's employ of their own accord, were employed by the private branch exchange subscriber.

In cases of this kind it was almost impossible to secure the desired co-operation between operators in establishing connections and the service suffered as a consequence. Each operator handling the connection blamed the other operator for any difficulty that might be experienced in the work. In order to bring about closer co-operation between the telephone company and the private branch exchange subscriber, telephone companies have recently been furnishing well-trained operators to handle the private branch exchange boards, carefully selecting from their operating force girls whose experience, training and personality especially fit them for the work.

A supervisor of private branch exchanges in the employ of the telephone company visits the various private branch exchanges regularly, carefully checking over the work in each exchange and diplomatically making such recommendations as she sees necessary. Ordinarily the private branch exchange operators are employed by the subscriber and, therefore, the supervisor can only recommend changes she may find necessary.

A great deal of tact and good judgment are necessary on the part of the supervisor in handling her work, but a great amount of good will result from P. B. X. supervision when the right person is chosen for the work. The supervisor should get acquainted with the P. B. X. operators and discuss their work with them. Especially she should find out what trouble they may be having with the service and see that nothing is left undone by the telephone company to rectify the difficulty.

In order to facilitate the handling of calls and to secure the maximum service

THE SEVENTH POINT.

Lincoln's methods teach us much. He would give away six points and carry the seventh, for the whole case depended on the seventh point. He would trade off trivial things to carry the big thought. Most of us "object" to every little detail until our objections become objectionable, and then we have no weight in the presence of the court of public opinion.—The Silent Partner.

from a minimum number of lines, it is usual for the trunks between a private branch exchange and the local exchange to be two-way trunks on which calls are both sent and received. It may be compared to the operation of a single track railway system.

This is especially true of smaller installations of ten or less trunk lines. Above this number it is frequently found desirable to have the trunks divided into two groups, and one group used for outgoing calls while the other group handles incoming calls only, as in the double-track railway system.

The particular disadvantage of the first-mentioned system lies in the fact that where a group of two-way trunks handles a large volume of traffic, the same trunk will frequently be selected and connected with by operators at each end of the trunk at the same time and the two calls, thus meeting on the trunk, are both blocked.

This often happens because the operators at the local exchange will frequently connect calling subscribers to trunks on which P. B. X. subscribers are calling in, and on which the local *A* operators have not yet answered the call.

With an average four-second answering time on the part of the *A* operators in the local office, an average period of four seconds elapses between the time the call comes in and the time the *A* operator answers. During this time the line is, technically speaking, busy, but an operator in the local exchange in testing the multiple will not receive a busy test on account of the fact that no plug has as yet been inserted in the answering jack. This period may be termed the unguarded period and in the case of heavy-loaded two-way trunks, will cause a great deal of confusion on account of incoming calls meeting the outgoing calls on the trunks.

In this case, as a rule, the two subscribers will stand at the telephone, their lines connected together, without knowing that a connection has been established. The one subscriber calling the private branch exchange will be waiting for an answer from the P. B. X. operator who will not get his signal. The P. B. X. subscriber will be waiting for the local exchange operator to answer and will receive no answer from her because his calling signal was extinguished when his line was connected with in the multiple by an operator completing an incoming call to the P. B. X.

Such a call will usually be abandoned by one or both parties, unless they happen to discover each other on the line. In this event, the operator is blamed for using a busy trunk when in reality she had no way of knowing the line was busy. Dividing a group of two-way trunks into two groups of one-way trunks will entirely eliminate this kind of trouble.

Good Program for Illinois Association Convention Next Month.

An exceptionally good program has been prepared for the 17th annual convention of the Illinois Independent Telephone Association to be held at the Leland Hotel, Springfield, Ill. on Tuesday, Wednesday, and Thursday, November 8, 9, and 10.

The addresses are to be given by men who are experts in their particular lines, and they will, no doubt, be very interesting and well worth hearing. An operator's school will be conducted by W. S. Vivian during the three days of the meeting, and it goes without saying that it will be a very successful one.

The program in full is as follows:

TUESDAY, NOVEMBER 8, 9:30 A. M.

Registration.

Operators' School, W. S. Vivian, Chicago.

Meeting of chairmen of standing committees.

Appointment of convention committees.

Meeting of board of directors.

Committee sessions.

TUESDAY, 1:30 P. M.

Invocation, Rev. Walter H. Cremeans, Springfield.

Address of Welcome, Chas. T. Baumann, mayor of Springfield.

Response to Address of Welcome, O. M. Burgess, Murphysboro.

Secretary-Treasurer's report, Jay G. Mitchell, Springfield.

President's Address, Dr. R. E. Gordon, El Paso.

"Practical Hints on Phantom Circuits," Professor R. V. Achatz, Purdue University, Lafayette, Ind.

Discussion led by H. D. Currier, Chicago.

Forum for Equipment and Construction Problems, Professor R. V. Achatz, LaFayette, Ind.; H. B. Crandell, Springfield; Dr. M. G. Lloyd, Washington, D. C., and H. D. Currier, Chicago.

WEDNESDAY, NOVEMBER 9, 9:30 A. M.

Operator's School, W. S. Vivian, Chicago.

"Hazards Involved in Overhead Line Construction and Methods of Meeting Them," Dr. M. G. Lloyd, electrical engineer, U. S. Bureau of Standards, Washington, D. C.

Discussion led by H. B. Crandell, Springfield.

Election of directors.

"Public Relations and the Consumer Market," John F. Gilchrist, Chicago.

Discussion led by C. B. Cheadle, Joliet.

"Interference to Telephone Service by Induction," David F. Hall, Chicago.

Discussion led by Professor R. V. Achatz, LaFayette, Ind.

Committee sessions.

WEDNESDAY, 1:30 P. M.

"Satisfactory Contact With the Public," A. R. Bone, Chicago.

Discussion led by E. R. Allen, Savanna.

"An Important Factor," E. C. Blomeyer, Chicago.

Discussion led by Louis Pitcher, Dixon.

Address, F. B. MacKinnon, president, United States Independent Telephone Association, Washington, D. C.

"Telephone Business," F. C. Stransky, Savanna.

Discussion led by W. H. Bassett, St. Louis, Mo.

Mechanical and Equipment Problems Forum.

WEDNESDAY, 7:00 P. M.

Get-together dinner and social session.

"Adventures in Altruism," Arthur J. Francis, D. D., Chicago.

THURSDAY, NOVEMBER 10, 9:30 A. M.

Operators' School, W. S. Vivian, Chicago.

"Preservation of Poles and Cross Arms by Antiseptic Treatment (Illustrated)," E. E. King, professor of Railroad Civil Engineering, University of Illinois, Urbana.

Discussion led by W. L. Ford, Carbondale.

Surprise Moving Picture, W. S. Vivian, Chicago.

Moving Picture, Canned Electricity, E. S. Meyers, Chicago.

THURSDAY AFTERNOON.

Golf tournament, Bunn Park.

Committee in charge: A. R. Patterson, Streator, and A. J. Parsons, Springfield.

Osceola (Mo.) Telephone Co. Changes Owners.

The Osceola Telephone Co., of Osceola, Mo., changed owners on October 14 when the state public service commission issued an order approving the sale by C. F. Mumma, of Holden, to J. E Passwater, of Osceola of all the property of the company, including poles, wires, switchboards and other equipment and machinery. The purchase price was $15,000.

No public hearing was held on the application, a letter having been received from the mayor of Osceola stating that the city had no objections to the transfer.

The Telephone As An Aid to the Longshoreman.

The telephone now enables longshoremen in Seattle, Wash., to communicate with their dispatching office regarding work.

On May 1, a change in the system of dispatching longshoremen to all docks and shops in the Seattle harbor was instituted. This change freed 700 longshoremen and truckers from sitting around in the employment hall waiting for work.

They are now able to keep in touch with the dispatching office by telephone during three stated hours each day. When they call, they are told if there is work in sight and if so when and where to go to find it.

"Telephony's" Home Study Course for Telephone Men

A Complete Presentation of the Principles Underlying Modern Telephony in All Its Branches—Arranged Systematically So That Regular Reading and Faithful Study Will Qualify Ambitious Men for Higher Positions—Prepared Under Supervision of Stanley R. Edwards—This Section Written by Jay G. Mitchell

Quiz Questions on the Preceding Installment.

1152. What are the conditions existing after the second series of switch-driving impulses, which are delivered to the connector switching equipment, has been completed? Does the third series of switch-driving impulses pass through the winding of relay *I*, Fig. 322, as well as the first and second series? Explain how the switch-driving impulses are delivered to the winding of the ringing-current selecting single-motion switch *S*, Fig. 322. What switch wipers are moved when single-motion ringing-current selecting switch *S* is operated? How are the common contacts over which wipers *T*, *U*, and *V* pass divided?

1153. How are the switch-driving current impulses, delivered to the winding of single-motion ringing-current selecting switch *S*, regulated as to their extent and duration? Explain the circuit over which the regulating relay *L* is energized when the single-motion ringing-current selecting switch is operated. What is the effect of the operation of relay *L* in connection with switch-driving current impulses received from the operator's equipment?

1154. Explain how the passage of switch wiper *T* from the fifth to the sixth contact of the bank changes the character of the ringing current being sent out to the called station. What is the similarity between this condition and the use of the divided circuit method of ringing in manual equipment operation?

1155. Explain the operation of slow-acting relays *F* and *H* in connection with the operation of the single-motion ringing-current selecting switch *S*. What is your opinion of the reason for the retention of the armature of slow-acting relay *H* until an appreciable interval of time has elapsed after the release of slow-acting relay *F*?

1156. Explain the relay conditions found to exist in the connector switching equipment immediately after the completion of the third series of switch-driving impulses. What follows the release of slow-acting relays *F* and *H*? What is your understanding of the relation between relay *B*, Fig. 322, and the cut-off relay of the *called* line circuit? Is one side of the called line circuit connected with the positive or grounded terminal of the common battery when ringing is being done? Explain why, in your opinion, this is brought about.

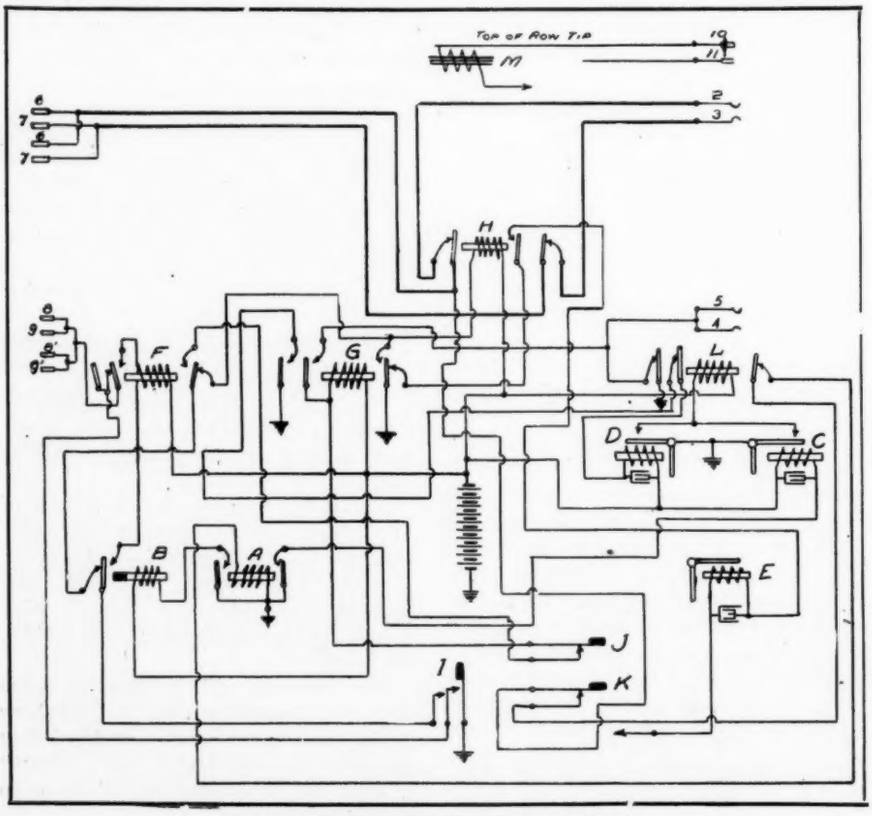


Fig. 321. The Intermediate Selector Circuit.

CHAPTER XXXIII. Operating Combinations Including Switching (Continued.)

1157. *The busy called line.*—The sequence of events that has been described covers the preliminary operation of the connector equipment when the called line is *not* busy. It is obvious that a call for an engaged line will require a somewhat different result in order to prevent the intrusion of a third telephone on the established connection.

Enough has been described, in the operation of the connector equipment, to make it plain that, when a connector switch has seized the line bank contacts of the called line and has established a connection with the calling line by means of a completed trunk circuit, current will be passing over the test bank contact of the called line and through its cut-off relay winding.

As a result of such a flow of current, the test bank contact will exhibit, to the exploring test wiper of the intruding connector switch, an increased potential. This is precisely similar, as far as the electrical condition is concerned, to the busy-test condition obtained in manual equipment through the sleeve contact of a plug elsewhere resting in the jack of the called busy line.

1158. *Circuit established upon release of slow-acting relay.*—As the test wiper of the intruding connector, 4 and 5, Fig. 322, reaches the test bank contact of the called line circuit, a flow of current occurs in a circuit which is traceable as follows:

Starting at the positive or grounded terminal of the common battery, the current passes through the winding of relay *B*, in the connector-switch equipment whose wipers are occupying the bank contacts of the called line at another bank, the test wipers, 4 and 5, of the *intruding* connector switch, the normally-open make contact of relay *R* (now closed), the normally-closed break con-

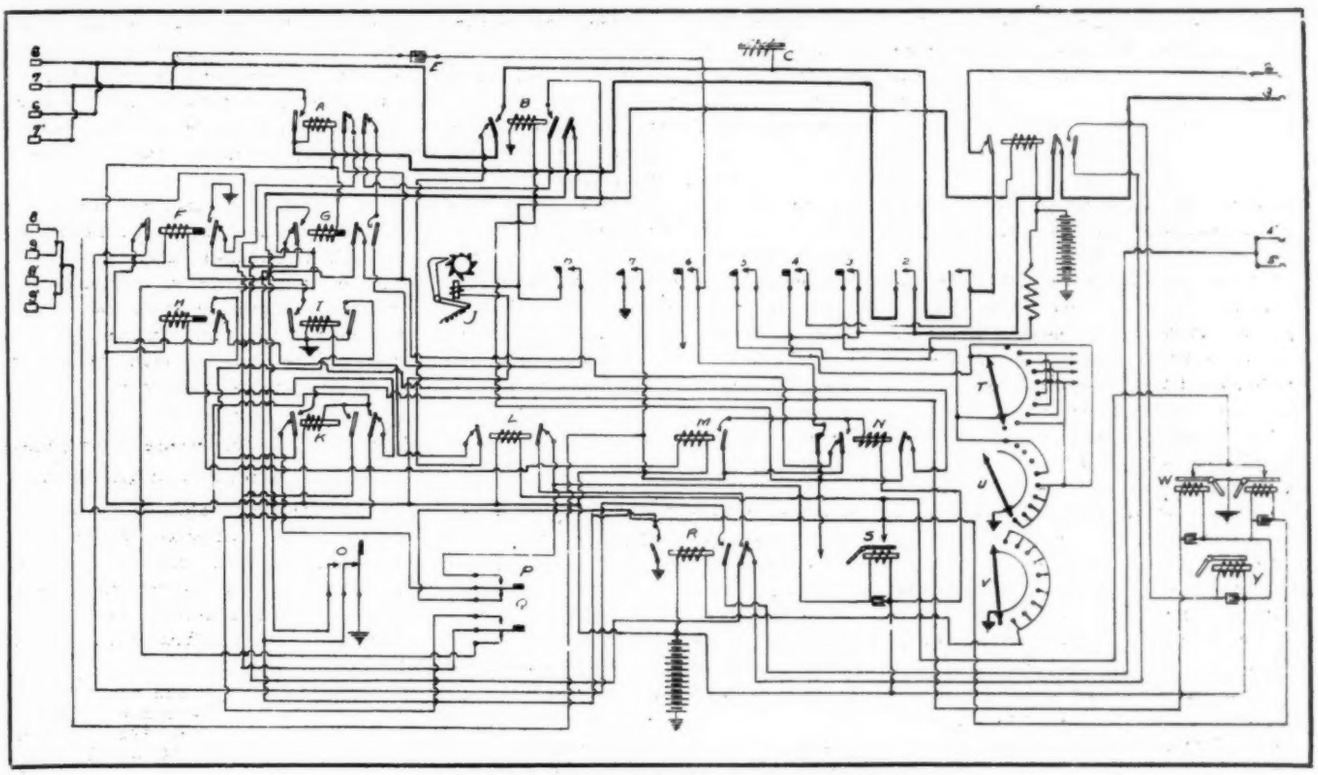


Fig. 322. Wiring of Connector Switch Equipment.

tact of slow-acting relay *F* (now normal), the normally-open make-and-break contact of slow-acting relay *H* (now closed), the winding of relay *M* and the common battery.

It is to be noted that this circuit is established just as soon as slow-acting relay *F* is released and *before* slow-acting relay *H* has had sufficient time interval to permit its own armature to resume its normal position.

As will be seen, the initial operation of relay *M* brings about the required condition in the equipment regardless of the fact that slow-acting relay *H* is almost instantly released after the passage of energizing current through the winding of relay *M*. The operation of relay *M* completes a path for a flow of current through the winding of relay *N* which is traceable as follows:

Starting at the positive or grounded terminal of the common battery, the current flows through the test bank contacts 8 and 9, of the intermediate selector switch banks and the intermediate selector switch test wipers resting upon them, Fig. 321, the normally-open make contact of relay *M* (now closed), the winding of relay *N* and the common battery.

1159. *Energization of "busy relay" N.*—As a result of the passage of current through this circuit, relay *N* is at once energized and completes a circuit through which holding current will thereafter be permitted to flow in its own winding which is traceable as follows:

Starting at the positive or grounded terminal of the common battery, the current flows through the energizing circuit for relay *N*, traced above, the normally-open make-and-break contact of relay *N* (now closed), the winding of relay *N* and the common battery.

As a result of the passage of current in the circuit just traced, relay *N* will be held in the operated poition, having been once operated, until the intermediate selector switch, Fig. 321, is released and withdraws its test wipers from connector trunk test bank contacts, 8 and 9.

1160. *Function of "busy relay" N.*—Relay *N* is very properly termed the "busy relay." The operation of relay *N* interrupts the circuit over which relay *B* and the cut-off relay of the called line would normally have been energized, thereby preventing the operation of relay *B* and the completion of the intruding trunk circuit through to the calling telephone.

This prevents the calling subscriber from hearing the conversation taking place on the called busy line. In the absence of this provision, relay *B* would probably be operated and would permit relay *A* to be operated, as a result of the flow of transmitter supply current to the called busy telephone, with a resulting interference between the existing connection and the one being built up. At the same time, relay *N* connects, by the operation of its normally-open make contact, a source of distinctive busy tone indicated by the arrowhead pointing downward in the drawing, to the calling line through the condenser, *E* and the completed intermediate trunk circuit. This is done to apprise the calling subscriber that the called line circuit is engaged.

1161. *The release on account of busy called line.*—Relay *Z*, shown at the upper right-hand corner of Fig. 322 unmarked, is held in the operated position from the moment that the first rotary step of the connector switch wiper shaft is taken. The energizing circuit for relay *Z* is controlled only by the rotary off-normal springs *O* and the normally-closed break contact of relay *B*.

Relay *R* will be released in a way to be described and as a result of the test wipers, 4 and 5, encountering the busy condition of the bank contacts of the called line, will complete a circuit through which current will be permitted to pass through the winding of the release magnet *Y* which is traceable as follows:

Starting at the positive or grounded terminal of the common battery, the current will pass through the normally-open off-normal break contact *O* (now closed), the normally-closed break contact of slow-acting relay *G*, the normally-closed break contact of relay *A*, the normally-closed make-and-break contact of slow-acting relay *G*, the normally-closed make-and-break contact of relay *R* (which has been released as a result of conditions to be described), the normally-open make contact of relay *Z* (now closed), the winding of the release magnet *Y* and the common battery.

As a result of the flow of current in this circuit, the release magnet *Y* is energized and its operation permits the switch wiper shaft to drop down the row and rotate to its normal position. The busy tone is transmitted to the calling subscriber, however, until the inter-

mediate selector switch has been released and has withdrawn the connection with the positive or grounded terminal of the common battery from the test bank contacts 8 and 9.

(To be continued.)

Report of Operations of Cuban Telephone Co. at Havana.

In a report submitted by the Cuban Telephone Co., of Havana, Cuba to the National City Co., New York City, a general outline of its operations, including the territory covered, the number of telephone stations operated, the type of equipment, etc. is given.

The Cuban company, according to the report, owns and operates over 35,000 telephone stations, served from 38 exchanges located in various parts of the island. These exchanges are inter-connected by a distribution and toll system consisting of 1,690 miles of pole lines with 12,000 miles of aerial copper wire, which does not include the local distribution systems in most of the important cities.

In Havana, a comprehensive system of underground conduits comprising approximately 1,000,000 duct feet is owned by the Havana Subway Co., all the bonds and a very large proportion of the stock of which is owned by the Cuban company. In addition, the telephone company directly owns underground systems in Santiago de Cuba, Matanzas, Cardenas, Cienfuegos and other important cities. Nearly 90 per cent of the telephones are automatic.

The company has operated for many years under a concession or authorization granted in 1909 by the president of the republic of Cuba in conformity with a law enacted by the congress, which, in the opinion of counsel, grants to the company the right to construct and operate without limit as to time, long distance lines to all parts of the island, and local telephone systems in all cities and towns where no old concessions exist.

At the present time, the company does the entire long distance telephone business in Cuba and operates without competition the local telephone systems in Havana and all other cities, with the exception of 11 communities where small Independent companies still operate. Upon the expiration of these old local concessions at various dates from 1924 to 1927, the Cuban Telephone Co. will have the right, without limit as to time, to render local and long distance telephone service to the entire Island of Cuba.

Receiver Appointed for Home Company at Mobile, Ala.

The Home Telephone Co., of Mobile, Ala., went into the hands of a receiver on October 10 on petition of the majority bondholders, according to a recent announcement in the local newspapers by W. H. Bryant, receiver. Mr. Bryant was formerly vice-president and general manager of the Home company. The company will continue to operate and furnish telephone service as heretofore in Mobile until such time as it shall be reorganized and placed on a sound basis.

During the war the Home company, like many other public utilities, found the cost of producing service so great that it was unable to earn its bond interest. A great majority of the bondholders, Mr. Bryant states, understood the situation and the difficulties under which the company labored and were willing to wait until such time as the company could resume its payments.

Several of the minority bondholders, however, according to Mr. Bryant, undertook by suit in the courts to enforce the payment of their unpaid coupons, and it was therefore necessary that a receiver be appointed in order that the property be preserved intact for the benefit of all the bondholders.

Mr. Bryant says that the company is well able to take care of its affairs, and in a public statement assures the public that the property of the company is in excellent condition, that the service will not be impaired, and that its financial condition will be very much bettered by the action that has been taken.

Earnings of Keystone Telephone Co. for Month of September.

A comparative statement of earnings for its combined companies for the month of September, 1921, and for the nine months of this year ending with September 30 has been issued by the Keystone Telephone Co., of Philadelphia, as follows:

	For month ended September 30, 1921	Year Previous
Gross earnings	$ 143,182	$ 149,184
Operating expenses and taxes	83,880	99,259
Net earnings	59,302	49,925
Less interest charges	39,937	36,654
Balance available for dividends, surplus and reserve	19,365	13,271

	For 9 months ended September 30, 1921	Year Previous
Gross earnings	$1,297,122	$1,298,604
Operating expenses and taxes	852,985	860,452
Net earnings	444,137	438,152
Less interest charges	352,374	323,718
Balance available for dividends, surplus and reserve	91,763	114,434

Commissions, Courts and Councils

Discussion and Rulings of State Bodies Having Supervision Over Telephone Companies—Decisions of Courts in Matters of Interest to Public Utilities and Actions of City Councils Relative to Franchise, Rates and Service

Asks for Rate Reduction Although Just Making Expenses.

Henry Schwartz, president of the Farmers' Union Telephone Co., of Winnetoon, Neb., has filed application with the state railway commission for permission to reduce rates on residence and farm service from $1.50 to $1.25 a month. Winnetoon is located not far from Bloomfield, where the flames of revolt at paying rates determined by the commission as necessary and lawful have been lighting up the telephone heavens.

It was not because his company is making too much money at the existing rates that Mr. Schwartz was impelled to ask for permission to reduce them. In fact, he sets out in his application that the present rates just about pay expenses of operation and maintenance and that none of the stockholders have had a dollar in dividends for two years.

Forty-two of his subscribers have already quit and a hundred others have threatened to have their instruments removed if the present rates are continued. Mr. Schwartz said he was compelled to choose between having no telephone company left or acceding to the demands.

Farmers nowadays are measuring everything in the price of bushels of corn —the cheapest they they produce—and it takes several times as many bushels now to pay telephone rental than it did several years ago. Mr. Schwartz sadly recalled that when farmers were getting $100 for a hog, he was getting for telephone service less than now for a part of the time. Now that farmers are doing business at a loss, they insist on the companies doing the same, although they were not permitted to reap big returns when the farmers were.

The application sets up that a reduction is not justified by the financial experience of the company, but that in view of the threat to stop service on the part of so large a proportion of the subscribers, it is deemed best to ask that the old rate of $1.25 for residence telephone be reinstated for the next eight months, with the understanding that if the financial condition of the farmers improves meanwhile, the rates now in force be re-

stored. The business rate of $2, now in effect, is to be continued. The company has 27 subscribers taking this business service.

The present rates were granted the company a year or so ago on a showing that an increase in revenue was necessary. It was not expected that they would return the owners anything, but they have enabled it to maintain proper service. Mr. Schwartz said that there has been no decrease in the cost of operating the plant since the war peak, while maintenance costs, so far as material used is concerned, have kept close to the top figures. It will be necessary, he said, to practice further economies to keep going at the rates the patrons demand shall be paid.

The company is largely owned by farmers, members of the local Farmers' Union. The present schedule of rates expires by limitation on November 1, and the threat to strike was aimed at any effort of the company to have the emergency rate order extended.

Reduction in Telephone Rates at Severy, Kans. Ordered.

A reduction in telephone rates at Severy, Kans. was ordered by the state public utilities commission in an order issued recently, as the result of an application filed by some 337 patrons at this exchange asking that the rates be lowered. The Emporia Telephone Co., which serves this territory, now charges the following monthly rates for telephone service as a result of this order:

Independent line business	$2.25
Independent line residence	1.25
Rural party line residence	1.25
Rural switching service	.50
Desk sets, extra, business and residence	.25

Higher Telephone Rates Placed in Effect at Howard, Kans.

A new schedule of telephone rates was placed in effect at Howard, Kans. by the Emporia Telephone Co. recently, under an order handed down October 7 by the state public utilities commission. The new monthly rates follow:

Independent line business	$2.50
Independent line residence	1.50
Rural party line residence	1.25
Rural switching service	.50
Desk sets extra	.25

Complains Because Company Uses Oil Stove in Exchange.

Can a state utility commission, as the arbiter of the destinies of a telephone company, determine the kind of a stove that a company shall use in its operating room?

The question has been put up to the Nebraska State Railway Commission by C. A. Randall, of Newman Grove. Randall says that the Monroe Independent company, which operates an exchange in his town, has its exchange located in an upper bedroom in a private residence, which is unsanitary, and that the room is heated by an oil stove, which causes an epidemic of headaches among operators. He also complains because the company has not increased wages of operators to $50 a month and put on the additional one ordered when its increased rates went into effect on October 1.

Commissioner Browne has replied that the commission must first find whether the use of oil stoves is determined to the service before it can order the company to remove them and substitute another form of heating. He also says that the company was never ordered to increase wages, on the contrary, the commission found the $42.50 a month was about right. He says that the company is justified in waiting, before increasing its force of operators, to find out how many of the subscribers will make good on their threat to strike if the new rates are continued in force, as the defection of a considerable number would make unnecessary another operator.

New York Telephone Co. Plans $50,000,000 Bond Issue.

In a petition filed with the New York Public Service Commission on October 22, approval of an issue of $50,000,000 worth of refunding, 20-year gold bonds, bearing not less than 6½ per cent annually, payable semi-annually, is requested by the New York Telephone Co. The proceeds of the sale are to be used for the improvement and extension of the company's facilities.

This issue will be known as series A and the principal will be payable October 1, 1941. Ten years from date of issue the bonds will be callable as a whole at 105 and accrued interest. Provision will be made for retiring the bonds from year to year if they can be purchased in the open market, but they will not be callable by the sinking fund trustee.

The bonds will be secured by a mortgage, subject to prior liens, to the Bankers Trust Co., of New York as trustee. This mortgage will be a lien on all property and franchises of the company in the state.

Under the terms of the mortgage, payment of the principal and interest of the 6 per cent debenture bonds issued by the company in February, 1919, also will be secured, and provision also will be made for such subsequent issue of bonds as may be required for further acquisitions and extensions that may be necessary.

Every Company Has Its Chronic Complaint Maker.

When Dr. E. A. Case, a physician of Curtis, Neb., inserted an advertisement in the local newspaper asking that all who were unable to get him by telephone, please let him know, he started an interesting controversy that is now being threshed out before the state railway commission. The manager, B. E. Fahrney, threatened to take the doctor's telephone out because of the advertisement, and then the doctor promptly lodged complaint before the commission.

The commission, as a result, has some interesting letters in its files, in which straight-from-the-shoulder language finds employment. Mr. Fahrney apparently has the better of the literary controversy backed up by real facts as to excellent service rendered.

Economical Management a Factor in Telephone Rate Raise.

Economical management won for the Cloverdale Telephone Co., of Cloverdale, Ore. an increase of 25 cents per month in its rates for telephone service. The state public service commission, in granting the necessary permission to the company, stated that the old rates were unjustly discriminating and would not yield any return on the investment, and that inasmuch as the property was being efficiently and economically operated, the rates should be raised. Here is the new monthly schedule approved:

Business service

	Wall Set
Individual line (Cloverdale)	$2.75
Two-party line (Cloverdale)	2.25
Suburban party line	2.25
Extension—without bell	.90
Extension—with bell	1.00

Residence service

	Wall Set
Individual line (Cloverdale)	$2.25
Two-party line (Cloverdale)	2.00
Four-party line (Cloverdale)	1.75
Suburban party line	1.75
Extension—without bell	.65
Extension—with bell	.75

Desk sets, 25 cents additional per month.

Switching service

Where subscriber owns and maintains instrument and line to exchange limits	.50
Where subscriber owns and maintains instrument and only a portion of line	.75

Miscellaneous

Extension bell—regular	.15
Extension bell—special loud ringing	.35
Special loud ringing bell with regular equipment, additional	.10

No objections were filed against the 25-cent increase in rates, but some complaints were expressed at the hearing by patrons as to cross-talk and "listening-in" on the lines. The cross-talk, the commission found, to be due to rather heavily loaded lines in some instances. However, the company announced its intention of constructing permanent lines, making divisions where practical, just as soon as the road program in that section of the state had been completed, so that this condition will be eliminated.

Service is furnished from 6 a. m. to 10 p. m. six days in the week and from

7:30 to 9:30 a. m. and 2:30 to 5:30 p. m. on holidays. Emergency calls are furnished at all hours of the day or night without additional charge. The patrons asked that an emergency operator be employed to give continuous service on holidays, the same as on week days. The company agreed to do this.

Cloverdale is the center of a thriving farming community, whose principal industry is dairying, having a population of about 250 inhabitants. The telephone company serves a number of small interior points, such as Hebo, Beaver, and Dolph and beach resorts and settlements to the west, such as Pacific City and Neskowin. A total of 207 stations, of which 175 are farmer lines, are served on 12 lines, all owned by the Cloverdale company.

On July 11 of this year fire destroyed the company's exchange building, so that it is now installed in temporary quarters. However, it contemplates establishing its own exchange building in the near future.

While nearly all the records were destroyed in the fire, some were available showing the company's operations from January 1 to August 31 of this year. Operating revenues totaled $3,144.65, including $455 outstanding bills uncollected. The total expenses, including the operator's salary, maintenance and depreciation, and the salary of the manager who serves as lineman and general workman were $3,208.50. This leaves a net balance of $63.85 for taxes and nothing for return on the investment.

Oklahoma City Hotels Petition for Lower Telephone Rates.

Petitions have been filed by several hotels in Oklahoma City, Okla., with the state corporation commission seeking a modification of the special telephone rates applying to hotels in that city. The hotels allege that these rates are exorbitant.

The cases were originally set for hearing before the commission for October 18, but were indefinitely postponed, pending an effort on the part of the hotels and the Southwestern Bell Telephone Co. to reach an agreement on the rates.

Washington Supreme Court Holds Rates at Spokane Are Legal.

The Washington Supreme Court on October 8 affirmed the Spokane County Superior Court in denying to F. C. Cavers consideration of 28 assigned claims of alleged overcharges for telephone service rendered by the Home Telephone & Telegraph Co., of Spokane.

The action was brought by Mr. Cavers in behalf of telephone users after the company filed new tariffs on residence telephones, following a merger with the Pacific Telephone & Telegraph Co., of Spokane, in 1915. The case was dismissed in the lower court on motion of the defendant and an appeal was taken.

The supreme court held that the new tariffs were legal, since the state public service commission did not act on them. It also ruled that telephone users' business interests were not affected, since the rates applied to residence telephones only.

Summary of Commission Rulings and Schedule of Hearings.

CALIFORNIA.

October 14: Complaint filed by the cities of National City and Chula Vista against the Pacific Telephone & Telegraph Co., charging excessive and discriminatory rates, and asking the commission to hold a public hearing in San Diego to determine just rates. Particular objection is made to toll charges for connection with San Diego, the complainants alleging that such charges are not exacted in the case of cities similarly situated.

October 20: Application filed by H. W. Glensor, of San Francisco, asking the commission to compel the Pacific Telephone & Telegraph to install a telephone in his residence. He states that on September 12 he paid the installation charge of $3.50, but that he has not as yet received the service, the telephone company advising him that it may be 60 days before installation can be made.

ILLINOIS.

October 5: Order issued resuspending until April 7 proposed advance in telephone rates in Galena and vicinity by the Illinois Bell Telephone Co.

October 6: Order issued vacating and setting aside order entered December 22, 1920; approving contract submitted by the petitioners and authorizing them to restore the lines existing at the time of the consolidation between the Central Union Telephone Co. and the Automatic Home Telephone Co. and to connect them with the switchboard of the Pontiac Farmers Telephone Co. in Pontiac.

October 6: Proposed advance in rates by the Danvers Telephone Co. in Danvers and vicinity resuspended until April 7, 1922.

October 12: The Cuba Central Telephone Co. granted a certificate of convenience and necessity to operate a telephone system in Cuba and vicinity and authorizing the company to issue common capital stock in the amount of $7,500.

October 26: Hearing at Chicago on application of the Lanark Mutual Telephone Co., of Lanark, for authority to increase its rates for telephone service.

October 26: Hearing at Chicago on citation order requiring the Lena Electric Light & Power Co., the Interstate Light & Power Co., the Stockton Electric Co., and the Pearl City Independent Telephone Co. to show cause in the matter of inductive interference on telephone circuits in Jo Davies, Stephenson, and Carroll counties.

KANSAS.

October 7: Application of the Emporia Telephone Co. for a certificate relating to a proposed issue of its preferred stock in the amount of $100,000, granted.

October 7: The Emporia Telephone Co. granted permission to file and put into effect a new schedule of rates at Howard.

October 7: In the matter of application filed by S. H. Reed on behalf of himself and 336 others similarly situated, all patrons of the Emporia Telephone Co. at Severy asking the commission to reduce the company's exchange rates; reduced schedule approved.

October 7: In the matter of application of the American Telephone Co. for permission to discontinue the charge of 50 cents per telephone per month for flat rate county service now being furnished at Soldier, and to substitute therefor, existing schedule of toll rates, also to file an amended schedule of rates providing for a charge of 50 cents per telephone per month for rural switching; both of the petitions allowed by the commission.

October 13: Application of F. J. Ross to sell his telephone plant and property at Hamilton, and adjacent territory to the Emporia Telephone Co., granted.

October 13: Application of W. D. Barrier of Eureka, for permission to sell his telephone line between Hamilton and Eureka, in Greenwood county, to the Southwestern Bell Telephone Co., granted.

October 14: Application of the Southwestern Telephone Co., of Meade, for a certificate relating to a proposed issue of its first mortgage bonds in the amount of $15,000, granted.

October 17: Application of the Baldwin Telephone Co., for the approval of a special vacation rate of 75 cents per month for independent line residence telephones, approved.

MISSOURI.

October 14: In the matter of application of the Home Telephone Co., of Joplin, for an extension of time in which to issue the remainder of additional bonds and preferred stock authorized on November 20, 1917; order amended extending time until December 31, 1922.

October 14: Order issued approving sale by C. F. Mumma, of Holden, and purchase by J. E. Passwater, of Osceola, of all the property known as the Osceola Telephone Exchange, of Osceola, for $15,000.

October 15: The Northeast Missouri Telephone Co., and the Bucklin Telephone Co., of Bucklin, authorized to continue in effect present schedule of rates for a further period of 13 months, from November 1, 1921 until December 1, 1922, unless otherwise ordered by the commission.

NEBRASKA.

October 17: In the matter of the application of the Bertrand Telephone Co. for permission to publish an increased schedule of rates; the company expressing a desire not to push the application at this time, ordered that the files be closed and the request dismissed without prejudice to a renewal.

October 18: Application filed by the Platte Center Telephone Co. asking for permission to increase certain rates on its schedules.

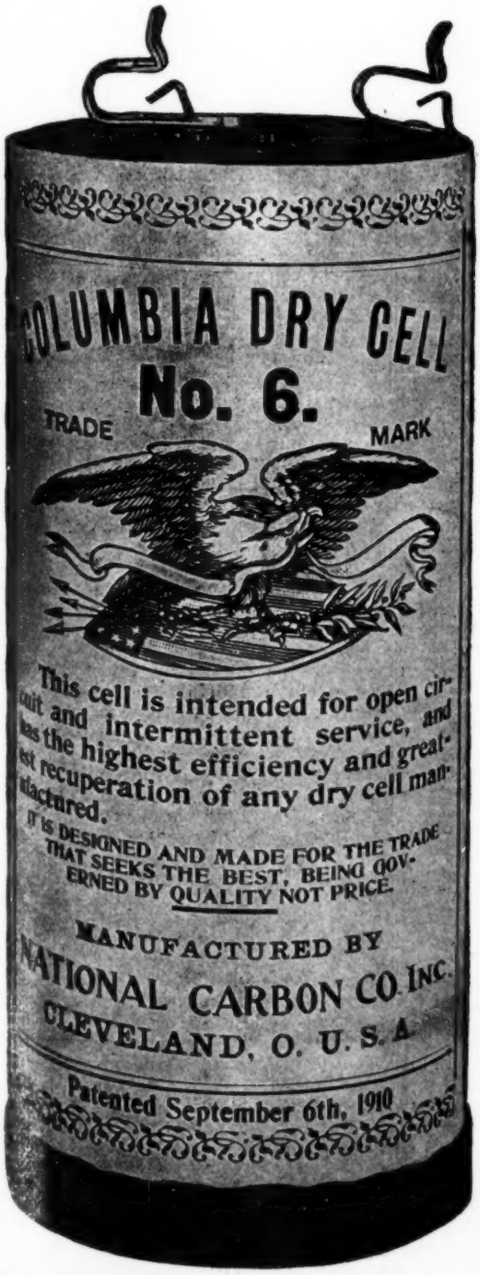
October 19: Application filed by the Farmers' Union Telephone Co. of Winnetoon for permission to reduce residence and rural rates from $1.50 a month to $1.25 a month, this being the rate in force at the time the present emergency rates, expiring November 1, 1921, were put into effect, in order to avert a threatened strike of telephone patrons.

October 19: Complaint filed by C. A. Randall, of Newman Grove, alleging that improper quarters are being furnished to employes by the Monroe Independent Telephone Co., and that wages promised are not being paid.

October 19: Complaint filed by the Winnebago Indian agency, by F. T. Mann, superintendent, against the Northeast Telephone Co., alleging insufficient service.

Columbia Telephone Cell

"less cost per day of service"


COLUMBIA DRY CELL
No. 6.
TRADE MARK
This cell is intended for open circuit and intermittent service, and has the highest efficiency and greatest recuperation of any dry cell manufactured.
IT IS DESIGNED AND MADE FOR THE TRADE THAT SEEKS THE BEST, BEING GOVERNED BY QUALITY NOT PRICE.
MANUFACTURED BY
NATIONAL CARBON CO. INC.
CLEVELAND, O. U. S. A.
Patented September 6th, 1910

THE LIFE-BLOOD of the telephone comes from the battery How much the instrument is alive depends upon the strength of the cells that nourish it. Long after the death-rattle of the ordinary line is heard, lines equipped with the Columbia Gray Label continue to speak up with the lusty vigor of youth. That's why telephone men choose Columbias—*less cost per day of service.*

National Carbon Company, Inc.
Cleveland, Ohio
San Francisco, Calif.

In Canada: Canadian National Carbon Co. Limited, Toronto

Fahnestock Spring Clip Binding Posts—No Extra Charge

142520

NEW YORK.

October 22: Petition filed by the New York Telephone Co. for approval of an issue of $50,000,000 worth of refunding, 20-year gold bonds, bearing interest at not less than 6½ per cent annually, payable semi-annually.

NORTH DAKOTA.

October 17: Petition filed by the Spring Brook Telephone Co., of Hannover, against the Oliver Mercer Telephone Co., of Center, asking the commission to make inquiry into the switching charges and consider certain connections to be made in that vicinity.

OKLAHOMA.

October: Petitions filed by several hotels in Oklahoma City asking the commission to modify the special telephone rates charged by the Southwestern Bell Telephone Co. applying to hotels in that city.

OREGON.

September 30: The Cloverdale Telephone Co., of Cloverdale, authorized to increase its monthly exchange rates.

WISCONSIN.

October 27: Hearing at Madison on application of the West Menasha Telephone Co., of Menasha, for authority to increase its rates.

Record of Telephone Patents

1,390,409. September 13, 1921; filed April 19, 1916. AUTOMATIC TELEPHONE SWITCH; 44 claims; H. G. Webster, Chicago. In this switch a number of movable wipers are adapted to make contact with stationary contacts. The wipers are controlled by a shaft operated by means of a pawl normally engaging a ratchet. Provision is made for throwing the pawl outward and holding it outward. The means for doing this controls the circuit of the stepping magnet which operates the ratchet.

1,390,580. September 13, 1921; filed November 13, 1918. MEANS FOR REDUCING INTERFERENCE; 11 claims; H. S. Osborne, New York; assigned to American Telephone & Telegraph Co. In this signal-transmitting system a receiving apparatus is connected to a line conductor and its return circuit has an impedance differing from that of the line conductor. A pair of conductors connect the line conductor and the return circuit with the receiving apparatus. Means located between the return circuit and the adjacent end of the conductor connect it with the receiving apparatus for preventing the receiving apparatus from being affected by voltages induced in the pair of conductors by outside sources.

1,390,679. September 13, 1921; filed November 21, 1919. IMPULSE TRANSMITTER; two claims; H. F. Dobbin and E. W. Gent, New York; assigned to Western Electric Co. The feature of the construction of this dial for an automatic subscriber's set consists of a retaining ring arranged to engage a number plate. Resilient fingers on the ring are arranged to engage the supporting plate to detachably secure the number plate to the supporting plate.

1,390,705. September 13, 1921; filed February 7, 1920. MEMORANDUM OR WRITING APPLIANCE FOR USE IN CONNECTION WITH TELEPHONES; 11 claims; J. McD. Hattersley, Birmingham, England. This memorandum device is designed for attachment to desk telephones. It consists of a base portion adapted to fit onto the base of the desk set. On one side is a hinge flat support while on the other side is located a paper supply device, the paper passing underneath the base through a channel to the flat support.

1,390,729. September 13, 1821; filed March 4, 1918. AUTOMATIC TELEPHONE SYSTEM; six claims; G. Simonetta and A. Rosa, Milan, Italy. In this automatic system, line-searchers are adapted to connect the caller's line to a called line automatically upon the lifting of the receiver hook at the calling station. Registrators are associated with the selected trunk and are rendered operative by the lifting of the hook. Selectors corresponding to the first figure chosen by the trunk line of the registrator are actuated by the calling line when the first figure is formed, whereby the calling line is connected to a second free trunk line having a second selector or connector, and the first registrator is rendered inoperative and a secondary registrator is inserted. The secondary registrator is thereafter operated to actuate the second selector similarly to the actuation of a first selector by the first registrator, or to select in the connector a point corresponding to the called line and to connect the first trunk line that is served by the caller's secondary registrator with the called line. The secondary registrator is set free upon the making of the connection. A group of magnets is provided for each trunk leading to the connector and are operable to maintain the connection of the calling line with the called line and to break the connection if the called line is busy.

1,391,046. September 20, 1921; filed September 2, 1919. LIGHTNING ARRESTER; eight claims; W. L. Cook, Chicago. A number of rows of discharge plates are arranged side by side on an insulating member, which in turn is supported by a base member. This base member has a row of openings in line with the discharge plates to space and position a number of wires and maintain them in respective positions relative to the discharge plates.

1,391,087. September 20, 1921; filed February 9, 1920. TELEPHONE ATTACHMENT; one claim; H. F. Zink, Jr., Chicago. A telephone attachment for keeping track of a number of calls made from a telephone is described. It comprises a disk arranged for attachment to the transmitter face plate. There are two dials of numerals on the disk, together with pivoted pointers for each dial. The pointers are independently and manually operable, the second dial being used to designate the number of complete revolutions of the pointer on the first dial.

1,391,135. September 20, 1921; filed November 16, 1907. SEMI-AUTOMATIC TELEPHONE SYSTEM; 58 claims; G. E. Mueller, Aurora, Ill.; assigned to Kellogg Switchboard & Supply Co. The feature of this semi-automatic system is a pair of electrically-connected step-by-step traveling switches between the calling line and the answering end of an operator's circuit. One of the switches serves on the initiation of a call to connect with the calling line and the other to connect with the operator's circuit.

1,391,136. September 20, 1921; filed June 20, 1908. TELEPHONE EXCHANGE SYSTEM; 42 claims; G. E. Mueller, Aurora, Ill.; assigned to Kellogg Switchboard & Supply Co. In this signaling system, a number of keys control the transmission of signals over the circuit and provision is made whereby each manipulation of one of the keys in the operation of transmitting a signal, changes in a pre-determined manner the electrical effects produced by the subsequent manipulation of any of the keys during the operation of transmitting the signal.

1,391,370. September 20, 1921; filed August 13, 1918. TELEPHONE RECEIVER; 14 claims; C. M. Clarke, Sewickley, Pa. This support consists of a supporting device which is clamped on the standard of a desk telephone set and engages the ear piece of the receiver as it rests upon the switch hook. By means of a thumb screw, the support may be raised so as to allow the switch hook to be operated.

1,391,442. September 20, 1921; filed August 8, 1914. CALL-SENDING DEVICE; 38 claims; A. Andersen, Chicago; assigned to Automatic Electric Co. This call-sending device comprises several impulse transmitters, with a single controlling mechanism for successively controlling their operation.

1,391,552. September 20, 1921; filed September 3, 1919. REPEATER CORD CIRCUITS; three claims; O. H. Loynes, Woodridge, N. J., and A. F. Rose, New Brighton, N. Y.; assigned to American Telephone & Telegraph Co. A cord circuit, which includes repeater apparatus, is provided at the central office for establishing connections with a toll-switching trunk. Means are responsive to the connection of the cord with the trunk for completing a bridge across the talking conductors of the cord and for completing a bridge across the network conductors of the cord. Supervisory signaling apparatus is controlled by the first-mentioned bridge and an impedance element is included in the second bridge having an impedance approximately equal to the impedance of the first-mentioned bridge.

1,391,586. September 20, 1921; filed June 23, 1917. ELECTRIC TRANSLATOR; 24 claims; F. M. Slough, Rochester, N. Y.; assigned to Stromberg-Carlson Telephone Mfg. Co. A progressively operable switch is arranged to occupy several selective positions. Circuits and resistance units are arranged as a Wheatstone bridge to directively control the setting of the switch.

1,391,587. September 20, 1921; filed January 28, 1918. SUBSCRIBER OPERATED TELEPHONE SYSTEM; 15 claims; F. M. Slough, Rochester, N. Y.; assigned to Stromberg-Carlson Telephone Mfg. Co. An automatic step-by-step switch for inter-connecting an incoming circuit with any of several outgoing circuits has off-normal contacts arranged to be closed only after a predetermined number of steps. An impulse relay, provided with contacts and operated over the incoming circuit, acts to control the means for advancing the automatic switch. A circuit for the release magnet for the switch is completed to the off-normal contacts and the trunk contacts of the impulse relay.

1,391,588. September 20, 1921; filed June 11, 1917. TELEPHONE SERVICE SYS-

The Policy

of Lynton T. Block & Co. is to issue the most satisfactory and comprehensive insurance to be had anywhere—

Furnishing absolute protection at cost.

Embodying all the standard features and more.

Covering special classes and selected risks.

Selling at established rates.

Returning savings at the end of the policy period, depending upon the individual experience of the risk.

Giving a claims service that is not equalled elsewhere.

It is an honest policy, carried out in an honest way and gives a square deal under all conditions.

This forms the creed of every member of the organization and has built up the reputation of Lynton T. Block & Co. until it is one of the best and most favorably known in the Mississippi Valley.

Insurance at Cost

Workmen's Compensation
Employers' Liability
Public Liability
Teams Liability
Contractors' Liability
Elevator
Automobile
Fire Insurance

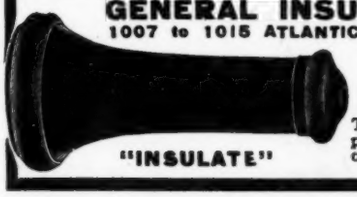
LYNTON T. BLOCK & CO.

UNDERWRITERS OF
INSURANCE AT COST
UTILITIES INDEMNITY & FIRE EXCHANGES
EMPLOYERS INDEMNITY CORPORATION

Chamber of Commerce Building **St. Louis, Mo.**

GENERAL INSULATE COMPANY

1007 to 1015 ATLANTIC AVE., BROOKLYN, N. Y.



"INSULATE"
or
"UNBREAKABLE"
Telephone Receiver Shells, Mouthpieces and Electrical Insulations of all shapes.

COPPER CLAD STEEL COMPANY

OFFICE AND WORKS:
RANKIN, PA. BRADDOCK P. O.

WESTERN SALES REPRESENTATIVES:
STEEL SALES CORPORATION, CHICAGO, ILL.

NEW YORK SALES OFFICE: 30 CHURCH STREET, NEW YORK CITY

COPPERWELD Wire—*Made by the Molten Welding Process.*
Bare—Weatherproof—Strand—Twisted Pair—Nails

FOR OLD TIME'S SAKE

Let us send you our new prices on printed supplies. Paper is still above the pre-war figure, but we are selling printed supplies on the old-time basis. Let us send you a few samples and interesting figures.

TELEPHONE OFFICE SUPPLY COMPANY
500 Main St. **Carthage, Missouri**

NORTHERN POLE and LUMBER COMPANY

POLE SERVICE

DULUTH MINNESOTA

NORTHERN-WESTERN CEDAR POLES

A FULL ASSORTMENT OF SIZES
PROMPT SHIPMENTS ASSURED

T. M. PARTRIDGE LUMBER COMPANY
Lumber Exchange **MINNEAPOLIS**

CEDAR POLES

NORTHERN or WESTERN
Plain or Butt Treated
THE VALENTINE-CLARK COMPANY,
SPOKANE, WASH.
Toledo **Chicago** **Minneapolis**

To insure delivery on time order your poles as early as possible.

White Cedar Poles

A SPECIALTY

Yards In Minnesota, Ontario, and Manitoba
Prompt and Satisfactory Service
CANADIAN CEDAR & LUMBER COMPANY, Limited
361 Electric Ry. Chambers **Winnipeg, Manitoba**

NORTHERN **CEDAR POLES** WESTERN
BUTT-TREATING GUARANTEED GRADES
BELL LUMBER COMPANY, MINNEAPOLIS, MINN.

TEM; 21 claims; F. M. Slough, Rochester, N. Y.; assigned to Stromberg-Carlson Telephone Mfg. Co. In this party-line system, apparatus at the central office is under control of one of the resistances included in circuits with the line to operate the particular signal to identify the substation whereat the resistance is located.

1,392,152. September 27, 1921; filed December 13, 1918. MULTIPLE STATION TRANSMISSION CIRCUITS; eight claims; W. H. Harden, Brooklyn, N. Y.; assigned to American Telephone & Telegraph Co. In the system described, a circuit has a section having separate lines for transmitting signals in opposite directions respectively. Some of a number of stations are bridged across this section of the circuit at various points and means are associated with the circuit for substantially equalizing the transmission from a selected one of the stations to each of the others.

1,392,179. September 27, 1921; filed September 5, 1918. OPERATORS' TRUNK CIRCUIT; 14 claims; G. W. Kuhn, Brooklyn, N. Y.; assigned to American Telephone & Telegraph Co. Switching means are associated with a trunk leading to a special operator's desk for connecting thereto the operators' telephone apparatus. A signal is controlled by a signal-responsive relay associated with the trunk and is responsive to the actuation of the relay by signaling current. A second relay associated with the trunk is responsive to the actuation of the switching means associated with the trunk to alter the responsive condition of the signal. A number of terminals and connections for the terminals and switching means are provided so that the trunk may be adapted for either common battery signaling or ring-down signaling by simple change in wiring.

1,392,762. October 4, 1921; filed November 28, 1913. SELECTED TELEPHONE SYSTEM; 28 claims; R. C. M. Hastings, Columbus, Ohio; assigned to International Telephone Co., Columbus. The feature of this selector switch is a shunt connection with the line provided with a switch. An electromagnet, influenced by the selecting device, controls means for opening and closing the switch of the shunt connection. A switch in the local battery circuit, which includes a transmitter, is controlled by the shunt connection switch whereby the local battery circuit is open when the shunt is closed and vice versa.

1,392,815. October 4, 1921; filed October 15, 1919. METHOD OF AND MEANS FOR DETECTING IRREGULARITIES IN TRANSMISSION LINES; 11 claims; G. Crisson, Hoboken, N. J.; assigned to American Telephone & Telegraph Co. This method of testing a line for a distant irregularity consists in comparing a sending current with respect to phase relation with the current reflected back by the irregularity.

1,392,820. October 4, 1921; filed April 20, 1921. LINEMAN'S SAFETY CHAIR; eight claims; J. W. Davis, Dallas, Texas. A seat is formed on a pair of end frames which have a bar connecting them. Braces are secured to the end frames and to the bars, and rollers are journaled on the end frames.

1,392,840. October 4, 1921; filed September 28, 1920. SANITARY TELEPHONE DEVICE; two claims; W. W. Lukenbach, Philadelphia, Pa. This attachment embodies a transmitter-receiving loop. Horizontally arranged and substantially parallel side bars are adapted to rest upon the shoulder of the desk stand standard. A receiver seat extends from the arms and is disposed on one side of the standard.

1,393,226. October 11, 1921; filed July 26, 1917. TELEPHONE SYSTEM; nine claims; A. B. Sperry, New York; assigned to Western Electric Co. An indicating device is located at an operator's position and is controllable from a distant point for indicating the designation of a wanted outgoing line. Continuously movable means are individual to the incoming line for operating the device to indicate the designation of the incoming line.

1,393,352. October 11, 1921; filed September 22, 1919. TELEPHONE SYSTEM; seven claims; W. L. Dodge, Maplewood, N. J.; assigned to Western Electric Co. A rotable sending distributor is located at one station for transmitting over a signaling path extending between two stations, code signals individual to different trunk lines. A rotatable receiving distributor is placed at the other station and signaling devices common to the trunk are associated with the receiving distributer and selectively responsive to like predetermined permutations of impulses transmitted by the sending distributer, depending on whether the distributer is rotating in unison or whether the receiving distributer is leading or lagging behind the sending distributor.

1,393,429. October 11, 1921; filed July 12, 1917. TELEPHONE SYSTEM; four claims; H. P. Clausen, Mt. Vernon, N. Y.; assigned to Western Electric Co. A visual call-indicating device—individual to a two-wire trunk extending between an exchange and a branch exchange—is responsive to the initiation of a call at the branch exchange end thereof. The cord circuits includes supervisory relays at the exchange. Means at the branch exchange differently actuate the call-indicating device and the supervisory relays.

1,393,430. October 11, 1921; filed January 4, 1918. TELEPHONE SYSTEM; six claims; H. P. Clausen, Mount Vernon, N. Y.; assigned to Western Electric Co. Several automatic switches have access to a telephone line terminating in a central office. A number of multiply-connected jacks at an operator's switchboard are normally disconnected from the line. Means including a relay are affected, when one of the automatic switches is not connected to the line, to connect any one of a number of manually-operated link circuits to any one of the jacks to the line.

1,393,465. October 11, 1921; filed September 4, 1919. TELEPHONE EXCHANGE SYSTEM; 11 claims; D. M. Taggart, East Orange, N. J.; assigned to Western Electric Co. In this system a signaling device is controlled over either a common battery or a local battery telephone line and operates independently of the type of connecting line to furnish a disconnect signal of one character and an automatically-sustained recall signal of a different character.

1,393,502. October 11, 1921; filed December 26, 1917. MACHINE SWITCHING TELEPHONE SYSTEM; 12 claims; H. P. Clausen, Mount Vernon, N. Y.; assigned to Western Electric Co. In this system, selected switches are controlled by a calling subscriber for establishing connections between telephone lines. Means under the control of either the two lines involved in the connection, operate the call bell of the other.

1,393,503. October 11, 1921; filed August 19, 1918. ELECTRICAL SYSTEM; five claims; H. P. Clausen, Mount Vernon, N. Y.; assigned to Western Electric Co. In this battery-charging system, electromagnetic means are placed in circuit with the battery and are dependent solely upon the voltage thereof for controlling the operation of a switch which associates the source of energy with the battery. An electro-responsive device is in circuit with the battery and is dependent upon the rate of discharge thereof for controlling the switch. Additional means prevent the operation of the electro-responsive device in case the battery is at its predetermined maximum potential.

1,393,521. October 11, 1921; filed April 27, 1917. MACHINE SWITCHING TELEPHONE SYSTEM; five claims; C. L. Goodrum, N. Y.; assigned to Western Electric Co. The feature of this system is the provision of apparatus for causing the operative interconnection of line and circuit terminals individual to each group of extending circuits. Means are common to the groups for controlling this apparatus and other means are provided for selectively operating the first-mentioned means.

1,393,522. October 11, 1921; filed October 25, 1918. TELEPHONE EXCHANGE SYSTEM; nine claims; C. L. Goodrum, New York; assigned to Western Electric Co. In this automatic system, a signal-movable means is arranged in operative relation to a line relay associated with the selector switch for controlling the operation of the primary means and also for releasing the selector switch.

1,393,558. October 11, 1921; filed August 7, 1919. TELEPHONE EXCHANGE SYSTEM; six claims; J. L. McQuarrie, Montclair, N. J., and C. L. Goodrum, New York; assigned to Western Electric Co. Electromagnetic means are automatically actuated upon the seizure of one of the selector or connector switches for associating an idle impulse relay of the corrosponding group with the switch to cooperate in the setting of the switch.

1,393,559. October 11, 1921; filed August 7, 1919. TELEPHONE EXCHANGE SYSTEM; six claims; J. L. McQuarrie, Montclair, N. J., and C. L. Goodrum, New York; assigned to Western Electric Co. In this automatic system provision is made for pre-allotting one set of contacts to its associated switch. Electromagnetic controlling apparatus, common to a number of sets of contacts, includes the pre-allotted set for controlling the operation of the switch with which the pre-allotted set is associated.

1,393,727. October 11, 1921; filed November 28, 1919. CALL-DISTRIBUTING SYSTEM; 14 claims; S. B. Williams, Jr., Brooklyn, N. Y.; assigned to Western Electric Co. Provision is made for connecting a subscriber's line with an operator's position over a path comprising an operator's selecting circuit terminating in means of selecting an idle operator's position. Selector switches establish a connection between the calling line and the operator's selecting circuit and switching means subsequently connect the terminals of the calling line to the cord circuit of the selected operator's position independent of the path.

1,393,728. October 11, 1921; filed December 8, 1919. TELEPHONE EXCHANGE SYSTEM; 15 claims; S. B. Williams, Jr., Brooklyn, N. Y.; assigned to Western Electric Co. In this automatic system a quick-acting finder switch is responsive to the initiation of a call on a line for associating selector switch-controlling mechanism therewith. An impulse circuit is established upon the initial association of the mechanism with the line and a second impulse circuit upon subsequent association of the mechanism with the line. Means controlled by the calling subscriber send impulses over both of the circuits and means responsive to these impulses set the controlling mechanism.